GLAMIS GOLD, INC.
GLAMIS DAISY MINE REWARD PROJECT

ENVIRONMENTAL ASSESSMENT
NV-053-99-059
N53-98-015P

December 1999
Revised March 2000

Bureau of Land Management
Las Vegas Field Office
4765 West Vegas Drive
Las Vegas, Nevada 89108

GLAMIS GOLD, INC.
GLAMIS DAISY MINE REWARD

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1 INTRODUCTION/PURPOSE AND NEED

1.1 Introduction

Glamis Gold, Inc. (GGI) operates the Glamis Daisy Mine located approximately four miles east of Beatty, in Nye County, Nevada (Figure 1-1). As an adjacent facility to the Glamis Daisy Mine, GGI proposes the development of a new ore deposit and associated facilities, the Reward Project (Project). GGI has submitted a Plan of Operations (POO) and Permit for Reclamation to the Bureau of Land Management (BLM) Las Vegas Field Office and the Nevada Department of Environmental Protection, Bureau of Mining Regulation and Reclamation (BMRR) for the Project (NV53-98-015P).

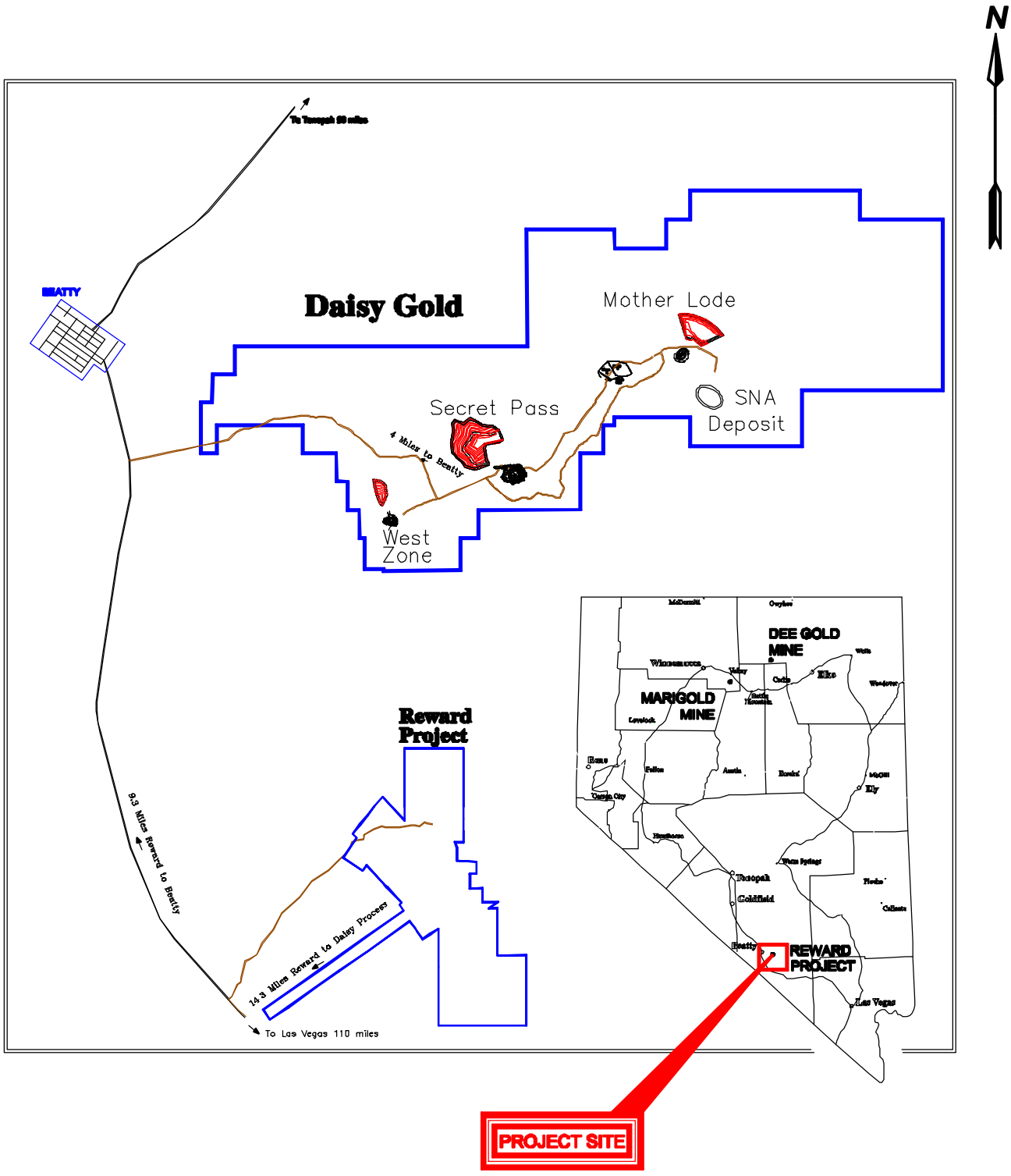
The Project is located in Nye County, approximately four miles south of the Glamis Daisy Mine, approximately eight miles southeast of the town of Beatty, Nevada, and three miles east of US Highway 95. The Project Area consists of 450 acres and is located in all or portions of Township 13 South, Range 47 East (T13S, R47E) Sections 2, 3, 9, 10, 11, and 14, (Figure 1-2). A water well and pipeline are needed to supply process water to the Project. The well and a portion of the pipeline would be located outside of the Project Area boundary, in portions of T12S, R46E Section 35; T13S, R46E Sections 1, 2, and 12; and T13S, R47 E Sections 7, 9, 10, 16, 17, and 18. The Project would be located on public and private lands. The public land is administered by the U.S. Department of the Interior, BLM, Las Vegas Field Office, Las Vegas, Nevada. The private land consists of six patented mining claims owned by Barrick and Elizalde and under lease by GGI. All GGI mining claims are lode claims. A complete list of the claims is provided in the Reward Project POO.

The proposed Project would involve the following:

- Development of the Reward deposit into an open pit mine;
- Construction of waste rock dumps associated with the Reward open pit;
- Construction and operation of a heap leach facility, including heap leach pads, collection system, process ponds, and carbon adsorption circuit;
- Construction and operation of an ore crushing facility;
- Use of an existing water well and construction of a water pipeline from the well to the Project Area;
- Construction and operation of ancillary facilities to support the proposed operation;
- Construction of mine haulage and public access roadways; and
- Ongoing development and exploration to include drilling and sampling.

1.2 Purpose and Need

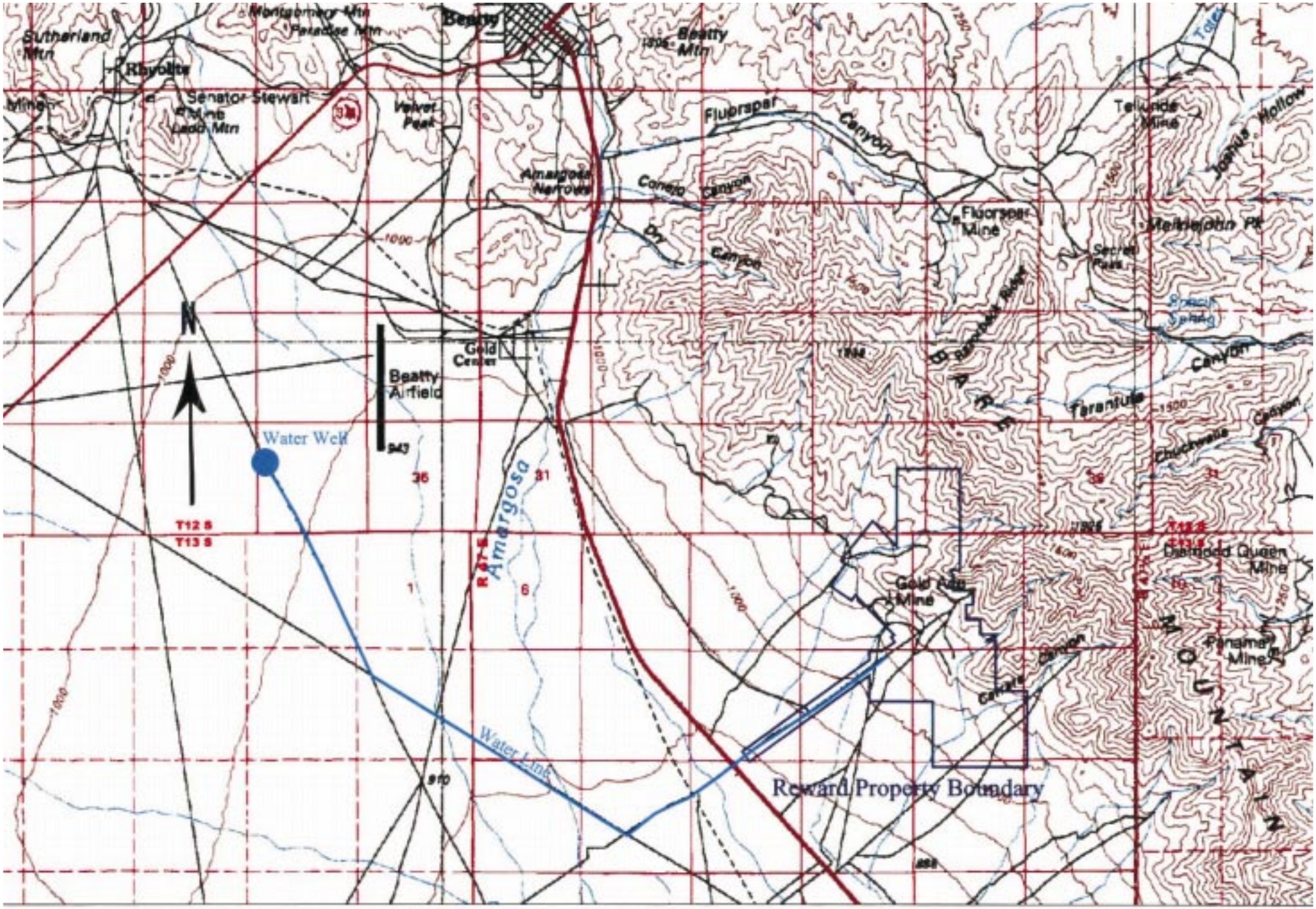
The purpose of the Project is to allow GGI to develop the Project and to continue to recover gold and silver ore resources identified on mining claims which have been staked or acquired by GGI under the General Mining Law of 1872. In addition, GGI would continue exploration and development drilling for additional precious metal-bearing deposits within the Project Area. The need is to allow GGI to meet the prevailing market demand for gold and silver.



STATE OF NEVADA

GLAMIS DAISY MINE
Reward Project
General Location Map

Scale	N.T.S.
Date	10/99
Drafted By	GLE
Checked By	MES
Revised By	CLM
File No.	1576FIGURE1-1.DWG
Project No.	1576
Figure	1-1



Property Boundary and Water Line Route

Glamis Daisy Mine Reward Project

Figure 1-2

1.3 Issues

On May 14, 1998, the BLM Las Vegas Field Office sent scoping letters to the Nevada Clearing House, directly to some state agencies, and to the Nye County Commission advising the agencies and Commission of the proposed Project. A second letter was sent to the same parties on March 22, 1999, following GGI's decision to substantially revise the Project and Plan of Operation (POO), and obtain the permits required to process the ore at the Project Area, rather than haul the ore to the Glamis Daisy Mine for processing. During the two scoping periods, five letters were received. The following issues and concerns were identified during scoping or determined by the BLM:

- Threatened, endangered, and sensitive species - including potential habitat for the black woolypod or Funeral Mountain milk vetch (*Astragalus funereus*), cacti, yuccas, and evergreen trees; sensitive habitats such as sand dunes, riparian zones, and others; potential habitat for desert tortoise (*Gopherus agassizii*);
- Reclamation - use of native and locally-collected or locally-adapted species in the reclamation seed mix;
- Noxious weeds - prevention of the introduction or spread of noxious or injurious weeds or other unwanted exotic species;
- Cultural resources - inventory and evaluation of cultural resources and potential impacts;
- Disturbance of potential bat habitat at the historic Gold Ace mine workings;
- Impacts of mining on bighorn sheep, and bighorn sheep access to the pit;
- Exclusion of wildlife from process solutions; and
- Vegetation removal during breeding/nesting season of local bird populations.

1.4 Land Use Plan Conformance Statement

This Environmental Assessment (EA) was written to comply with the BLM regulations for mining activities on public lands under the General Mining Law of 1872, subject to compliance with Federal Land Policy and Management Act (FLPMA), which is implemented through the surface management regulations (43CFR 3809) as mandated by the Council of Environmental Quality Regulations, (40 CFR 1500-1508), and the BLM National Environmental Policy Act (NEPA) Handbook (BLM 1988).

The Proposed Action and alternatives described in Section 2.0 are in conformance with the Las Vegas Resource Management Plan, approved by Record of Decision dated October 5, 1998, and are consistent with federal, state, and local laws, regulations, and plans. Objectives of the Minerals Management Program are as follows: 1) provide for the orderly exploration and development of valuable minerals on federally owned mineral estate, whether or not the surface estate is in federal ownership, where lands remain open to entry; and 2) use appropriate environmental safeguards to allow for the preservation and enhancement of fragile or unique resources. The Standard Operating Procedures for locatable minerals are included in Appendix A of this EA.

2 PROPOSED ACTION AND ALTERNATIVES

2.1 Existing Operations

To date, exploration drilling and associated access roads and drill pads have been the only existing operations at the Project Area. The most recent exploration operations have been conducted by GGI under BLM Notice N53-98-010N.

2.2 Proposed Action

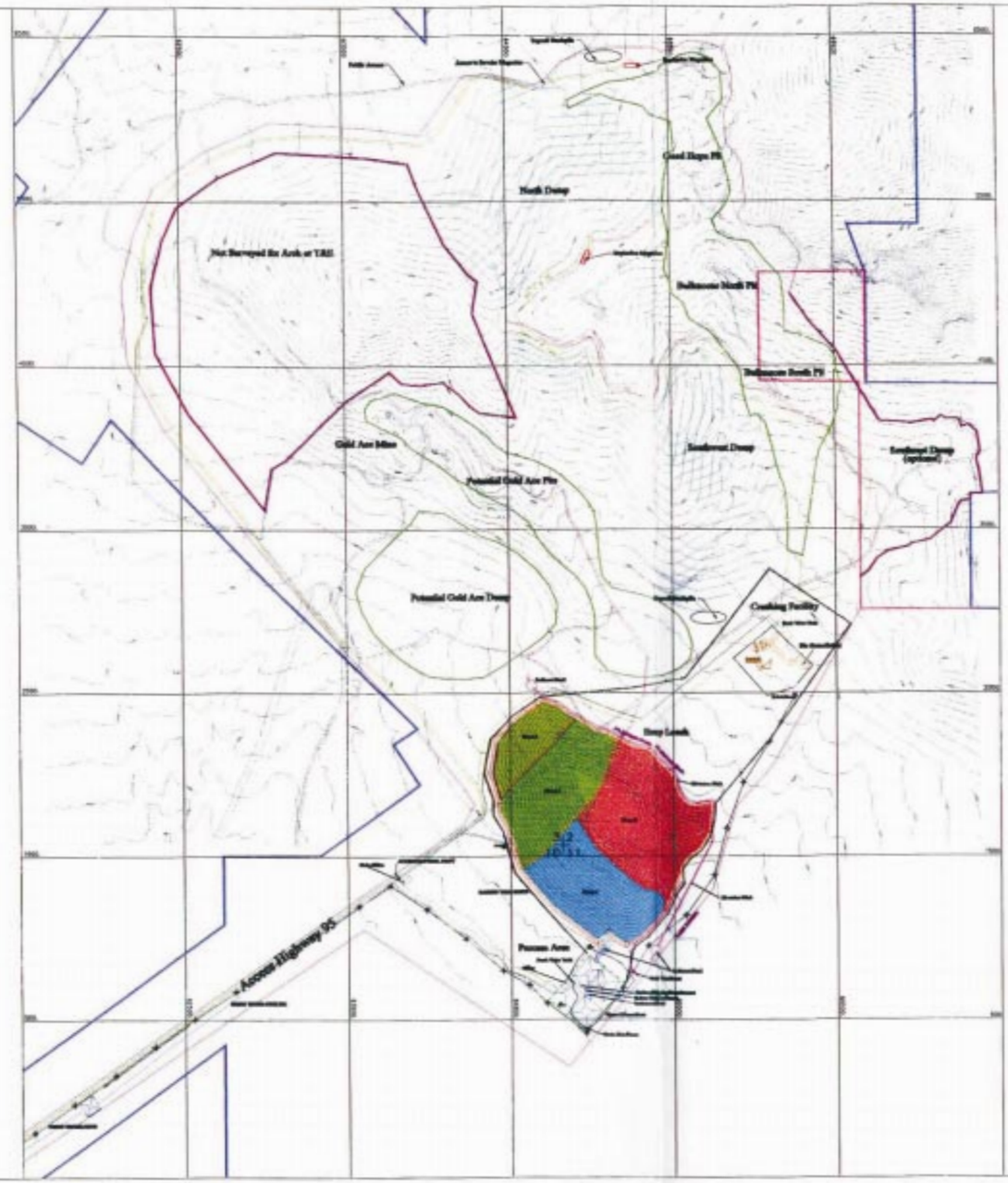
The following components are included as part of the Proposed Action:

- Development of the Reward deposit into an open pit mine;
- Construction of waste rock dumps associated with the Reward open pit;
- Construction and operation of a heap leach facility, including heap leach pads, collection system, process ponds, and carbon adsorption circuit;
- Construction and operation of an ore crushing facility;
- Use of an existing water well and construction of a water pipeline from the well to the Project Area;
- Construction and operation of ancillary facilities to support the proposed operation;
- Construction of mine haulage and public access roadways; and
- Ongoing development and exploration to include drilling and sampling.

The Proposed Action would directly impact approximately 214 acres within the 450 acre Project Area. The Proposed Action described below is based upon current considerations of practicality, economics, and environmentally acceptable facility operation. Table 2-1 details the proposed surface disturbance for the Proposed Action, and the proposed facilities are shown on Figure 2-1. The Gold Ace Pits and dumps shown on Figure 2-1 are not part of the Proposed Action but are considered part of a Reasonably Foreseeable Future Action, as discussed Chapter 4. Of the 214 acres of proposed disturbance, 191.5 acres are located on lands administered by the BLM and 22.5 acres are located on private lands. The proposed disturbance assessed throughout this EA is based on a $400 per ounce gold price, to provide maximum flexibility over the life of the Project. The actual area of surface disturbance would depend on the price of gold and gold contracts during the period of operation. Therefore, the actual area of surface disturbance is likely to be less than assessed in this EA, and would not exceed the level of disturbance analyzed in this EA. However, the estimates of tons of ore, waste, and processed materials are based on current economics.

2.2.1 Exploration

Exploration activities needed to expand the known mineral reserves deposits and other mineral resources within the Project Area would continue through the life of the Project and would include geochemical sampling and exploratory drilling. Approximately 15 acres of public and/or private lands within the Project Area would be subject to these exploration activities. Condemnation drilling



N

0 400 800 1600

Scale: 1" = 400'

Legend:

- Power Line
- Chainlink Fence
- Barbed Wire Fence
- Property Boundary
- Pipeline
- Private Land
- Diversion Ditch

REVISIONS				
No.	DATE	MADE BY	DESCRIPTION	
1			RECORD DRAWING	
2				
3				
4				
5				
6				
DATE		DRAWN BY	CHECKED	APPROVED
4-27-99		CRH	RAH	

Note: Topography is from a February 1999 survey conducted by Daisy Gold Mining Co.

DAISY GOLD

GLAMIS DAISY MINE

GLAMIS GOLD LTD.

REWARD MINING PROJECT
PROPOSED ACTION

DRAWING NO. 2-1

PROJECT NO.

Table 2-1: Surface Disturbance Associated with the Project By Land Status

Component	Proposed Surface Disturbance (acres)	
	Public Land	**Private Land**
Exploration[1]	15.0	0.0
Open Pit	42.0	8.0
Waste Rock Piles	53.0	14.0
Heap Leach Pad	23.0	0.0
Ore Processing	3.0	0.0
Ore Crushing Facility	3.0	0.0
Ancillary Facilities	18.0	0.0
Roads	34.5	0.5
Totals	**191.5**	**22.5**

[1]The location of the disturbance associated with exploration has not yet been determined; however, it is likely that the majority of the disturbance would occur on public lands.

has been conducted in the locations of waste rock dump sites and ore processing facilities, which have not confirmed the presence of any mineralization amenable to open pit mining.

2.2.2 Open Pits

The Reward deposit would be mined as part of the Proposed Action. The Reward deposit consists of these three claim blocks: Good Hope, Bullmoose North, and Bullmoose South. The claim block names have been used to refer to portions of the Reward open pit. Current minable ore reserves are approximately 2.8 million tons (mt) of oxide ore. Approximately 5.1 million tons of waste rock would be mined as part of the Proposed Action. At a $400 per ounce gold price, the proposed open pit would be approximately 3,000 feet in length by 700 feet in width, with a plan view area of approximately 50 acres. The depth of the open pit would be approximately 400 feet, with the ultimate pit floor at an elevation of 3,800 feet above mean sea level (amsl). Little or no accumulation of surface water in the open pit is anticipated. Mineralization occurs primarily in the Wood Canyon Formation, which includes fractured quartzites and permeable carbonate rock types that would not be conducive to trapping surface waters on the pit bottom. The Proposed Action does not project the need to manage a pit lake due to the fact that net evaporation is greater than precipitation, therefore, the development of an ephemeral pit lake is not anticipated.

Figure 2-2 shows the post-mining topography of the open pits as well as other Project facilities. Figures 2-3, and 2-4 show cross-sections of the open pit. Haul roads accessing the open pit would be approximately 70 feet wide with a maximum gradient of 10 percent. A total of approximately 7.9 million tons of ore and waste rock would be mined under the Proposed Action. Mining operations are projected to span approximately 3 years, beginning late 1999 and finishing in 2002. Additional ore processing and site closure would occur after 2002. Berms would be constructed around the

accessible areas of the open pits during the initial stages of mining for safety reasons and would be approximately five feet high.

The Reward deposit would be mined on 20 foot benches using conventional open pit mining techniques including drilling, blasting, loading and hauling. Following blasting, the waste rock would be loaded into haul trucks with a front-end loader and transported to one of the waste rock dump areas. As an option under the Proposed Action, GGI may also use waste rock to partially backfill a portion of the open pit. This partial backfill would allow for a reduced size of waste rock dumps, thereby keeping surface disturbance to a minimum, while optimizing mining efficiencies. Oxide ore would be transported either directly to the oxide heap leach pad or to the portable crushing facility prior to delivery to the heap leach pad.

The open pit mining schedule is projected to require up to two 10-hour shifts per day, five days per week. This schedule would provide the most effective use of the capital-intensive haulage and excavating equipment. The majority of mining equipment that would be used to mine the Reward deposit is listed in Table 2-2, although actual equipment may vary depending on production schedule.

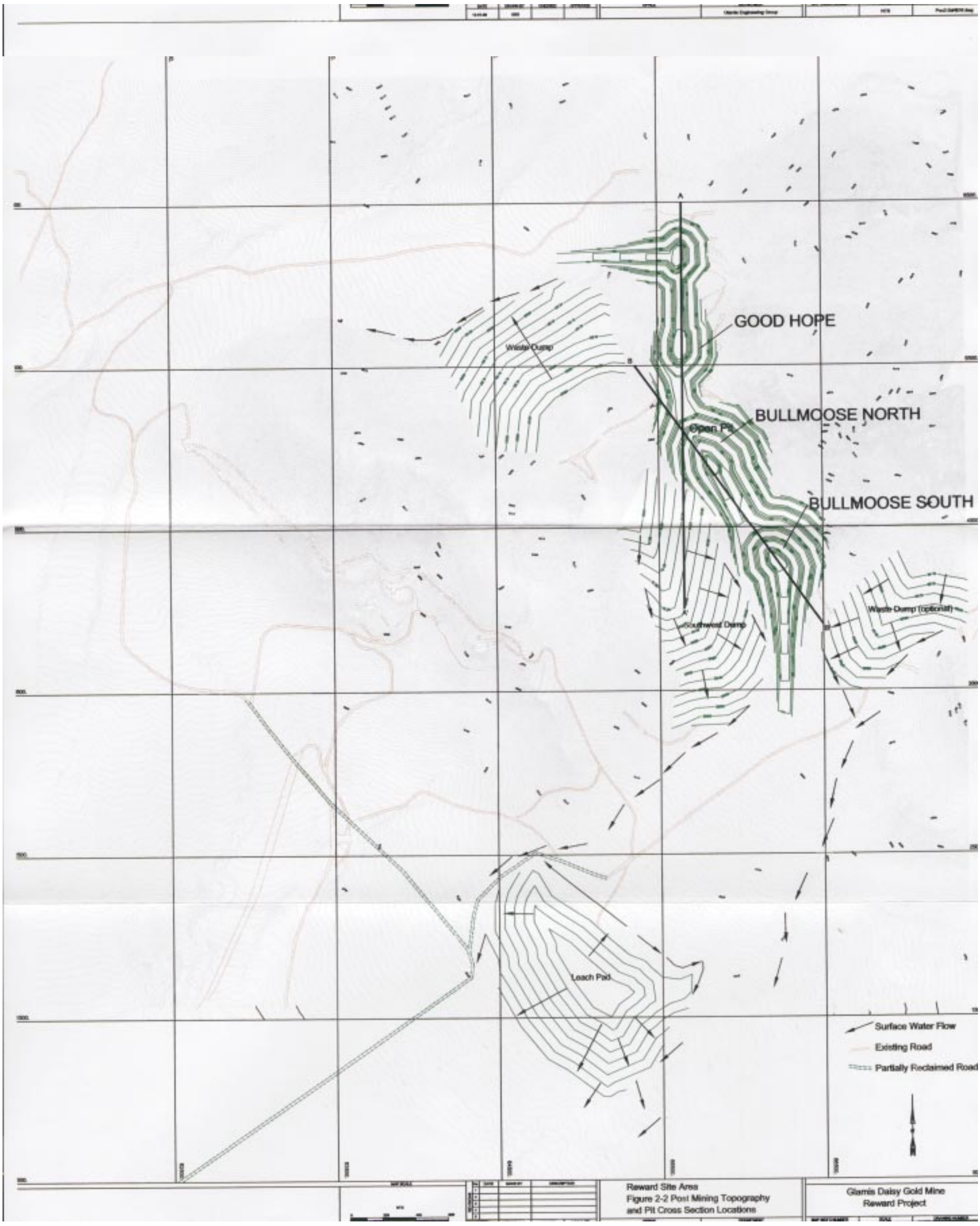
Table 2-2: Proposed Mining Equipment to be Used at the Project

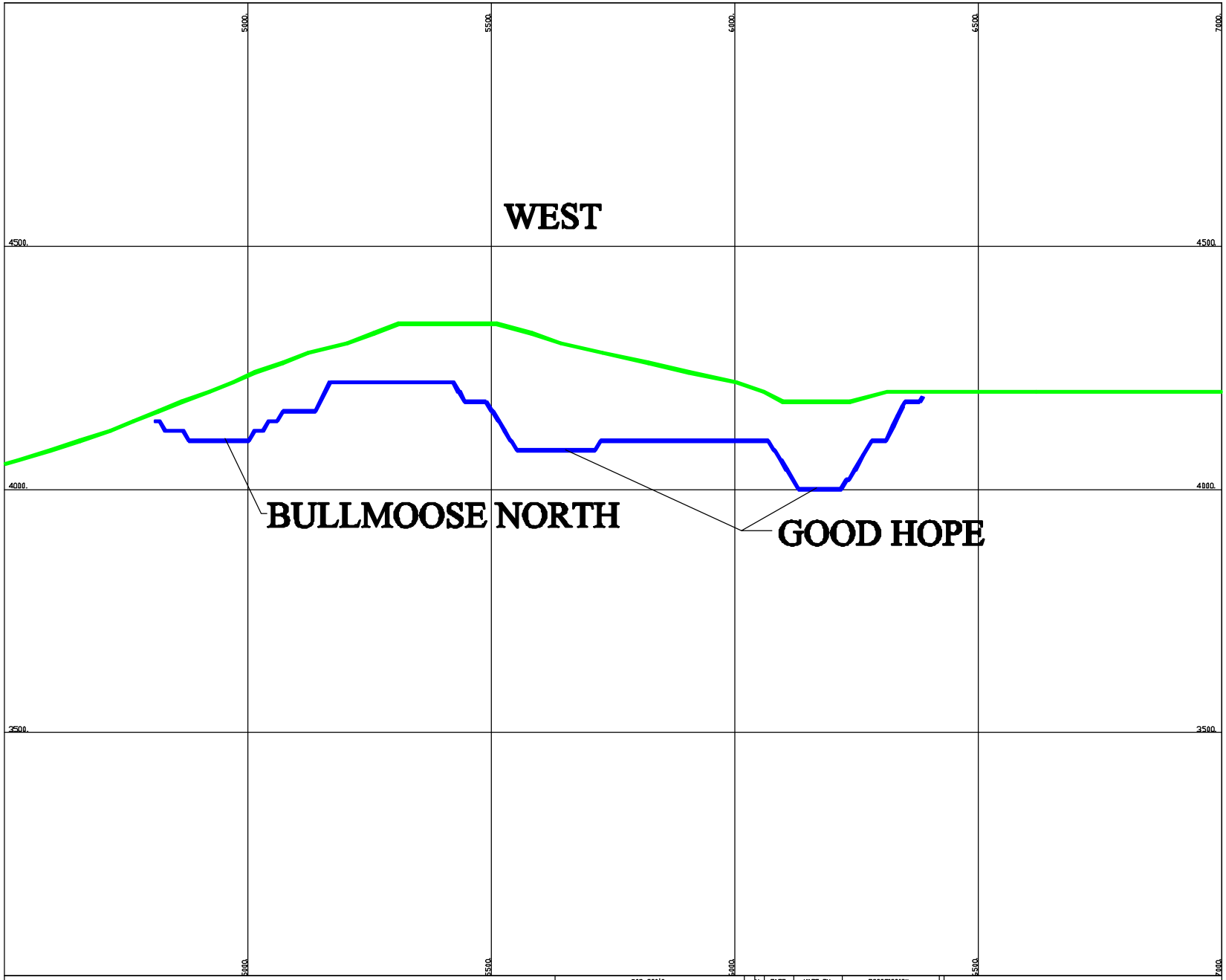
Type of Equipment	Number
Loader (Cat 992 and/or Cat 988)	3
50 or 85-ton haul truck (Cat 773 or Cat 777)	6
Motor grader	1
Water truck	1
Prill and/or ANFO truck	1
Dozer (Cat D8, D9, and D10)	3
Blast hole drill (one active, one spare)	2
Pickup truck	4

2.2.3 Waste Rock Dumps

As part of the Proposed Action up to three waste rock dumps would be constructed to contain the approximately 5.1 million tons of waste rock produced during mining operations. These three waste rock dumps, the North Dump, Southwest Dump and Southeast Dump, would be approximately 67 acres in size and provide sufficient capacity for disposal of waste rock (Figure 2-1).

The waste rock dumps would be constructed by end-dumping the material on the active face of the dump at the angle of repose (38 degrees). The waste rock dumps would be constructed in lifts not to exceed 100 feet. Final dump slopes would be constructed at an overall slope ranging from 2.5H:1V to 3H:1V. The ultimate heights of the waste rock dumps would vary from 240 to 320 feet.


GOOD HOPE
Waste Dump
BULLMOOSE NORTH
Open Pit
BULLMOOSE SOUTH
Waste Dump (optional)
Southwest Dump
Leach Pad
Surface Water Flow
Existing Road
Partially Reclaimed Road
Reward Site Area
Figure 2-2 Post Mining Topography
and Pit Cross Section Locations
Glamis Daisy Gold Mine
Reward Project



GLAMIS GOLD, INC.
GLAMIS DAISY MINE
REWARD PROJECT

Cross Section A-A'

Proposed Pit Outline

map scale
0 100 200 300

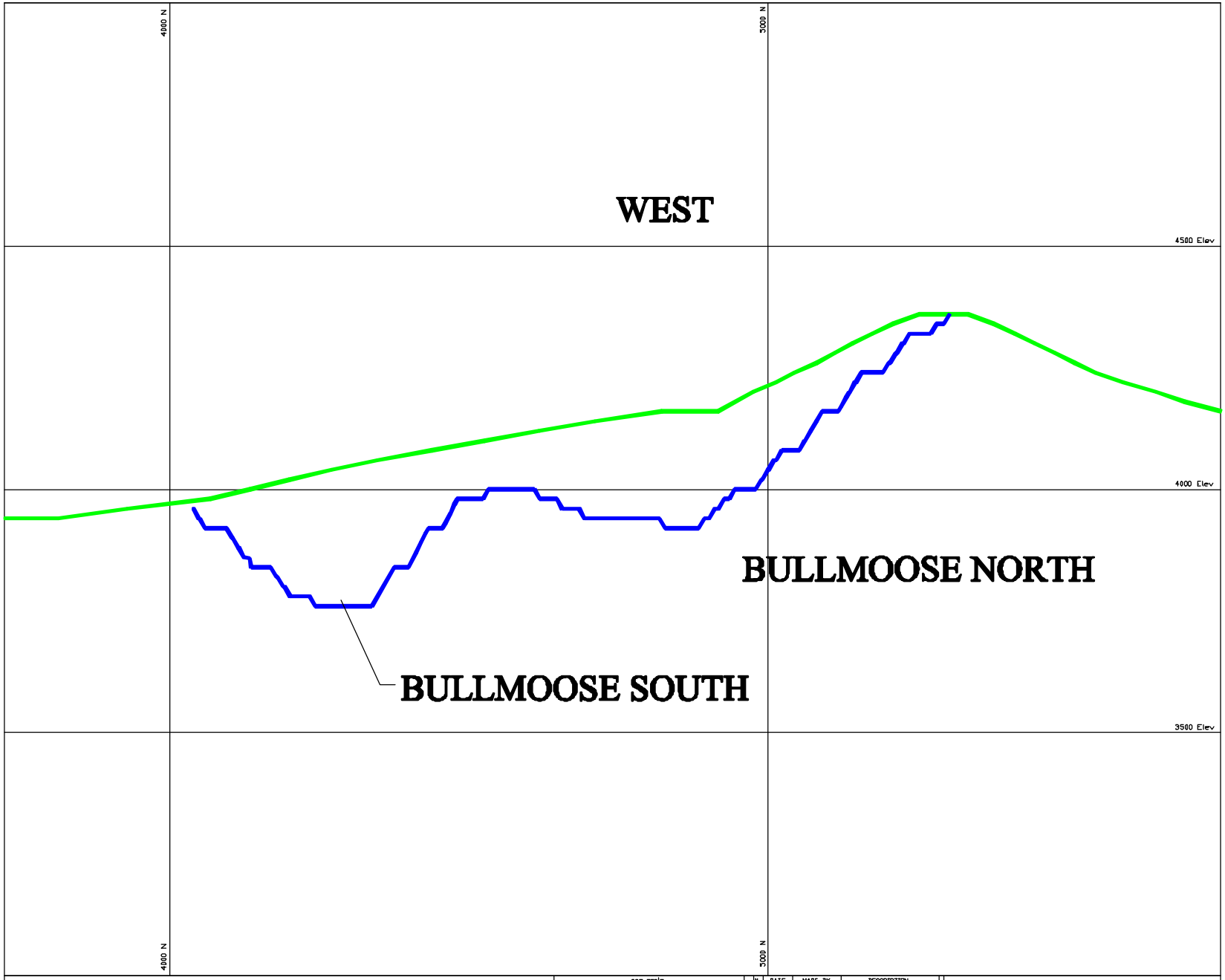
REVISIONS	No	DATE	MADE BY	DESCRIPTION
	1	10/99	CLH/ENA	Adapted to EA
	2			
	3			
	4			
	5			

DATE	DRAWN BY	CHECKED	APPROVED
12-23-99	GEG		

Section 5310 45' Search
Reward Deposit

DRAWING NUMBER	SCALE
1576Figure2-3.dwg	1"=100FT

Figure 2-3



GLAMIS GOLD, INC.
GLAMIS DAISY MINE
REWARD PROJECT

Cross Section B-B'

Proposed Pit Outline

map scale

0 100 200 300

REVISIONS	No	DATE	MADE BY	DESCRIPTION
	1	10/99	CLN/EMA	Adapted to EA
	2			
	3			
	4			
	5			

DATE	DRAWN BY	CHECKED	APPROVED
04-09-99	GEG		

Typical Orthogonal Section
Reward Deposit

DRAWING NUMBER	SCALE
1576Figure2-4.dwg	1"=100FT

Figure 2-4

2.2.3.1 Partial Backfill Option

As an option under the Proposed Action, GGI may use waste rock to partially backfill a portion of the open pit. This partial backfill would allow for a reduced size of waste rock dumps, thereby keeping surface disturbance to a minimum, while optimizing mining efficiencies. This option would be implemented if sequencing of mining operations, worker safety, and waste characterization issues can be addressed. Partial backfilling of the Bullmoose North area with waste rock from the Bullmoose South area, as part of the regular (i.e., direct haul) waste rock disposal, rather than a second handling of waste rock, may be possible. This would depend on the actual sequencing required to maintain ore production during the mining operation. Backfilling would not be conducted in the Bullmoose North area during active mining of this portion of the Reward Pit as a matter of mine safety. Waste characterization results would need to demonstrate that the waste does not have potential to degrade waters of the state prior to using waste rock for any backfilling.

2.2.3.2 Waste Rock Characterization

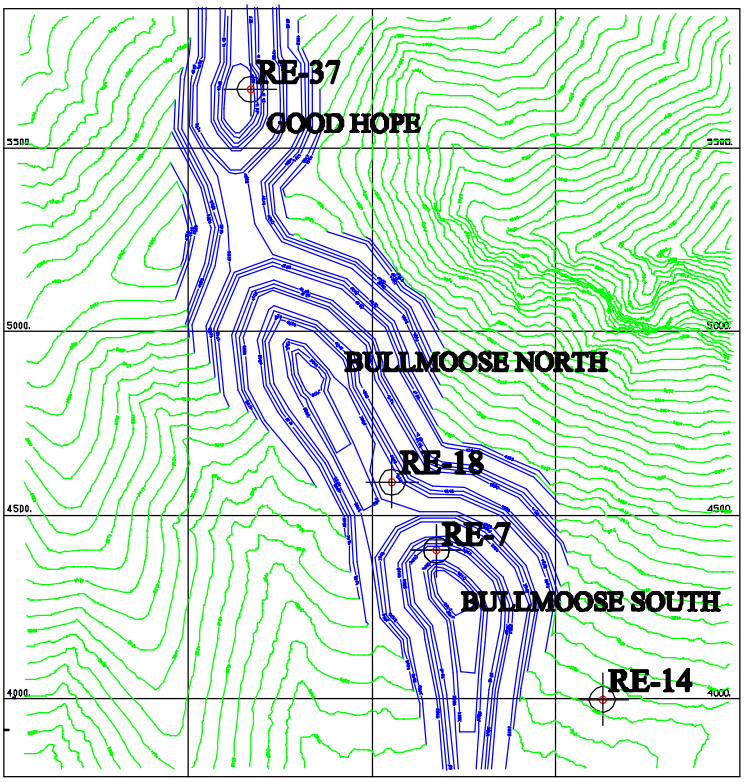
Waste rock from the Reward open pit would be geologically similar to other resources mined at the Glamis Daisy Mine (particularly the West Zone deposit) (BLM 1996, pages 2-6 through 2-8), and would be regularly sampled, characterized, and reported in accordance with the Water Pollution Control (WPC) permit issued for the Project. An application for the WPC permit is currently under review by Nevada Bureau of Mining Regulation and Reclamation (BMRR). Figures 2-5, 2-6, 2-7, and 2-8 summarize the Reward open pit waste rock by geologic unit, with accompanying geologic cross sections.

2.2.3.3 Acid Generation Potential

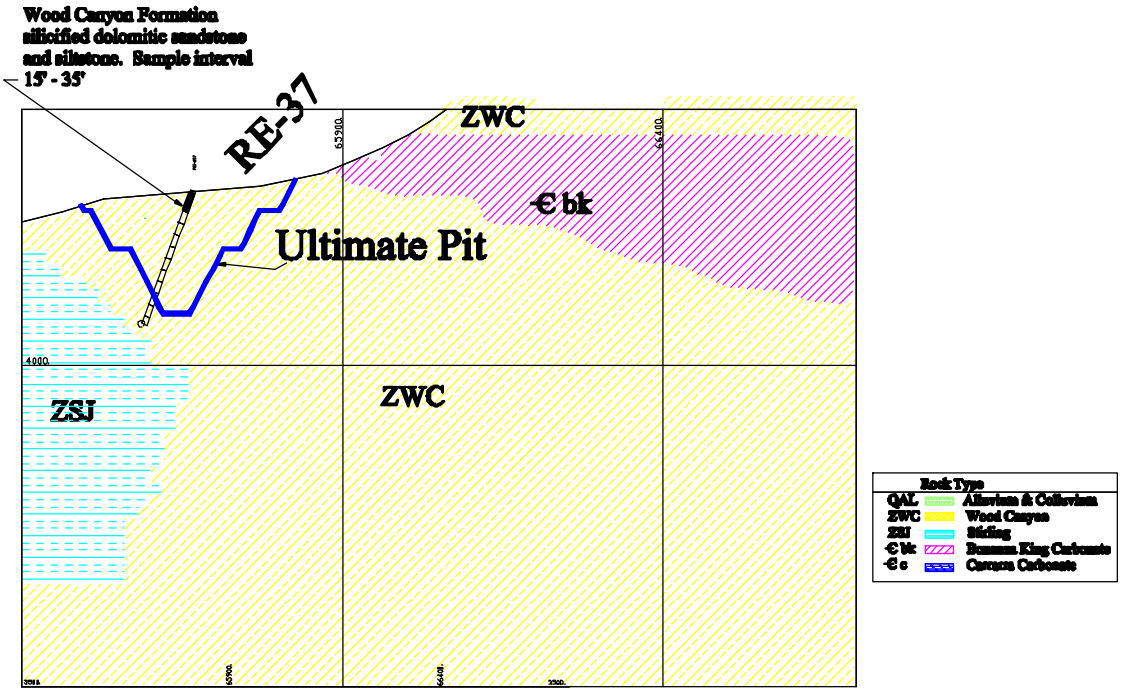
A geologic and geochemical analysis has been conducted on the Reward open pit waste rock material for acid generation potential. In summary, all of the rock units are net acid neutralizing, with acid neutralizing to acid generating ratios of more than three (i.e., 3:1). Two rock formations, the Bonanza King and Carrara, were not sampled due to their relatively small quantity (3.6% percent of the total volume of waste rock to be mined), and because they would be mined and deposited concurrently with other acid neutralizing rock types. The overlying alluvium and colluvium are composed of the same material as the underlying waste rock and, therefore, were not characterized.

Waste rock samples, representing the different rock types, were obtained from several drill holes in the proposed open pit (drill holes are depicted on Figures 2-5, 2-6, 2-7, and 2-8) and analyzed. Acid neutralization/generating potential and waste volumes by rock types are presented in Tables 2-3 and 2-4, respectively.

The associated acid neutralization potential/acid generation potential (ANP/AGP) ratios of waste rock range from 5:1 to 2,387:1. Based on NDEP guidelines any material with a ANP/AGP ratio of less than 1.2 (i.e., 1.2:1) may be potentially acid generating.



Plan Location Map and Lithologic Section for Waste Characterization Samples - Reward



Nevada / Beatty	MAP SCALE: NOT TO SCALE DRAWING TITLE: REWARD SOURCE TYPE: ACAD SOURCE FILE: 1576Figure2-5.dwg	GLAMIS DAISY MINE REWARD PROJECT LITHOLOGIC SECTION FOR SAMPLE RE-37	REWARD PROJECT WASTE ROCK CHARACTERIZATION DATE: 10/99 DRAWN BY: CLM/EMA DESCRIPTION: Adapted to EA	FIGURE: 2-5

Table 2-3: Rock Types and Acid Neutralization/Generation Potential Analysis

Rock Type	ANP[1]	AGP[2]	ANP/AGP Ratio	Sulfide Sulphur (%)	Sulfate Sulphur (%)	Non-Ext[4] (%)
Stirling Formation (Quartzite)	1.5	<0.3	5:1	<0.01	<0.01	<0.01
Wood Canyon Formation (Silicified, sandy, silty Dolomite)	16.9	<0.3	56:1	<0.01	<0.01	<0.01
Wood Canyon Formation (Quartzite, Phyllite, Schist)	55.6	<0.3	185:1	<0.01	<0.01	<0.01
Wood Canyon Formation (Quartzite)	18.5	<0.3	62:1	<0.01	<0.01	<0.01
Quaternary Alluvium and Colluvium[3]	716.0	<0.3	2,387:1	<0.01	<0.01	<0.01

[1]Acid Neutralization Potential.
[2]Acid Generating Potential; the detection limit is 0.3.
[3]Also represents the Bonanza King and Carrara Carbonate rock type.
[4]Non-extractable sulphur after the nitric wash.

Table 2-4: Waste Rock Volumes by Rock Type

Rock Type[1]	Volume (Tons)	% of Total
Quaternary Alluvium and Colluvium	386,000	7.50
Wood Canyon Formation (All Types)	3,796,000	73.80
Stirling Formation	777,000	15.10
Bonanza King and Carrara Carbonate	185,000	3.60
Totals	**5,144,000**	**100**

[1]All rock types are fully oxidized

2.2.3.4 Meteoric Water Mobility Considerations

The waste rock samples were also analyzed using the Meteoric Water Mobility Procedure (MWMP). Test results are summarized in Table 2-5.

Table 2-5: Results of Meteoric Water Mobility Analysis

Rock Type	Drill Hole #	Sampled Interval(s) Feet	Constituents Exceeding Drinking Water Standard
Stirling Formation (Quartzite)	Surface	0	None
Wood Canyon Formation (Silicified, sandy, silty Dolomite)	RE37	15-35	pH
Wood Canyon Formation (Quartzite, Phyllite, Schist)	RE7	30-50	None
Wood Canyon Formation (Quartzite)	RE18	50-70	pH
Quaternary Alluvium and Colluvium[1]	RE14	10-30	pH

[1]Also represents the Bonanza King & Carrara Carbonate rock type

Analytical results of the MWMP leachate showed that only pH exceeded the drinking water standard (6.5 to 8.5) in three of the five samples. The pH exceedances ranged from 8.86 to 9.05.

It is anticipated that only oxidized rock material would be mined and that oxidized material would be placed on the waste rock dumps. However, if unoxidized waste rock material were encountered, the unoxidized rock would be blended with oxidized material unless the volume of unoxidized material were sufficient to segregate. The unoxidized material would then be isolated and covered with a suitable material to reduce the potential for acid rock drainage (ARD). Material placed in waste rock dumps would be sampled and managed pursuant to the BMRR Water Pollution Control permit requirements.

2.2.4 Ore Processing Facilities

The approximately 2.8 million tons of ore would be hauled from the open pit and delivered, via haul trucks, to either the heap leach facility as run-of-mine ore or the ore crushing facility for crushing prior to delivery to the heap leach facility.

2.2.4.1 Heap Leach Facilities

Ore delivered to the heap leach facility would be processed with conventional cyanide heap leaching technology. Figure 2-9 shows a typical heap leach process flow diagram. The current design for the heap leach pad is as follows:

- Ore would be stacked to a maximum height of 150 feet; and
- Pads and process facilities would meet or exceed current federal, state and local environmental regulations.

The heap leach pad would be located southwest of the Reward open pit and would be constructed in multiple phases, in accordance with BMRR design requirements, using a conventional double-lined pond system to accommodate ore production. The heap leach pad would have a minimum design capacity of 3.0 million tons based on an average bulk density of 20 cubic feet per ton. The pad would encompass a total area of approximately 23 acres. The first phase of construction would accommodate approximately 400,000 tons and would encompass an area of approximately seven acres. The limits of Phase 1 are shown on Figures 2-1 and 2-10. The process pond complex is located immediately down gradient of the heap leach pad.

Prior to heap leach pad construction, the site would be graded to generally follow the natural topography. This would be accomplished by leveling the natural ground, cutting ridges and filling swales to provide a suitable foundation for the liner system. The heap leach pad would not exceed a 14 percent slope.

The leach pad would be designed with a two-liner system consisting of either of the following: a double sided textured 60 mil high density polyethylene (HDPE) geomembrane overlying a compacted 12-inch layer of low permeability (1×10^{-6} cm/sec) soil liner; or a double sided textured 60 mil HDPE geomembrane overlying a geosynthetic clay liner (GCL). Other geomembranes may be utilized; however, additional testing would be performed to determine the suitability of the material for the proposed construction. All construction design would be consistent with BMRR's Water Pollution Control permit requirements.

The liner system would be overlain by a 1.5-foot layer of crushed ore or drainage gravel to assist with solution collection and protect the liner during ore placement. Solution collection would be controlled by construction of perimeter collection ditches and berms, and installation of solution collection piping. To control and monitor flow, two separate collection header pipes would transport solution from various sections of the pad, as defined by natural drainage features within the area. Each header pipe would be perforated within its specific collection section, and then would continue to a sediment pond through non-perforated pipe within a lined solution ditch to provide secondary containment. The double lined sediment pond would provide a flow impediment to allow sand size particles to drop out of the flow stream prior to being collected by a weir and directed by pipe to the pregnant pond.

The heap would be stacked in 15 to 30 foot lifts to an ultimate height of 100 to 150 feet. Each lift would be constructed by truck dumping or conveyor stacking the ore to the angle of repose. Each subsequent lift would be set back from the edge of the previous lift to create a 2.5H:1V intermediate slope for each group of three lifts.

Initial stacking would always be staged to begin at the lowest elevation on the leach pad. The initial lift along the downgradient toe would be stacked directly against the downgradient berm to provide maximum stability for the first lift. The first lift along the side and upgradient portions of the leach pad would be set back 30 feet from the outside berm and several intermediate benches would be constructed to obtain an overall slope for the entire heap of approximately 3H:1V (from the crest of

the ore to the centerline of the outside berm). The benching would minimize the amount of grading necessary to reclaim the heap to final slope configuration at closure of the Project. The ore drainage layer would be extended 15 feet beyond the toe of the heap on the side and upgradient pad perimeters.

Leaching would be accomplished with a dilute sodium cyanide solution ranging in concentration from 0.10 to 1.0 pounds of sodium cyanide per ton of solution. Caustic soda would be added to maintain the pH of the solution between 10.5 and 11.0. Leach solution would be applied to the heap by means of a watering system capable of flow rates of 700 to 1,000 gallons per minute.

2.2.4.2 Solution Ponds

Under Phase 1 of the heap leach facility construction the pregnant and barren pond would be constructed as a single pond with an internal separation berm to provide process solution separation (Figures 2-1 and 2-10). The Phase 1 pond would have a total storage capacity of 1.8 million gallons and would cover 0.85 acres (37,030 square feet) in area. Storm water storage would be facilitated by the portion of the pond above the separation berm and 2 feet below the crest during the Phase 1 pad operation. This volume is designed for 750,000 gallons. The pregnant pond would hold approximately 450,000 gallons at a level of approximately 11 feet below the crest of the separation berm. The barren pond would have the capacity for approximately 600,000 gallons at a level of 14 feet below the crest of the separation berm. An overflow weir would be constructed between each of the ponds to allow for transference of the surplus solutions after significant storm events or under emergency shut-down conditions. The design of the Phase 1 pond is based on containment of a 25-year, 24-hour storm event (totaling about 7 acres), a 1 million-gallon operating capacity, and a 12-hour draindown condition assuming full flow at 700 gallons per minute (gpm).

The barren pond would have the capacity for approximately 600,000 gallons at a level of 14 feet below the crest of the central berm. The barren pond would be utilized to recondition the stripped process solution prior to recirculation to the leach pad. The barren solution return pipe would be contained in the same single-lined ditch that contains the pregnant solution pipe. The pond operational sideslopes would be 2.5H:1V. Each solution pond would be double lined with a primary 60 mil HDPE liner. It has been assumed that the secondary liner would be a 40 or 60 mil HDPE geomembrane.

Leak detection would be provided by a blanket HDPE geonet material between liners that would drain to a gravel filled collection trench and recovery sump. Collected solutions would be recovered from the sump through a 12-inch diameter collection port constructed, smooth-walled solid HDPE riser pipe which would be placed in the sump and run up the sideslopes of the pond between the two layers and daylight in the area of the anchor trench area outside of the containment area. The collection port could accommodate submersible sump pumps.

Under Phase 2 of the heap leach facility construction, the Phase 2 Storm water/Barren Pond would be built prior to Phase 2 expansion of the leach pad, and would be designed to contain the storm

water volume from the expanded pad liner system. This pond would be designed as a single 60 mil HDPE-liner storm water pond with capacity of approximately 800,000 gallons and a depth of 15 feet. An additional 200,000 gallon capacity would provide storage capacity for the extra 300 gpm, 12-hour draindown condition. The life-of-mine pond complex for the heap leach facility has been designed with a minimum combined capacity of 2.8 million gallons to contain normal process volumes plus storm water. A settlement pond would be situated between the Phase 1 and Phase 2 ponds. This pond is provided mainly for the addition of chemicals (flocculent) and control of any suspended solids during this process.

2.2.4.3 Processing

The carbon column process flow rate would range from 700 gpm to 1,000 gpm. Under the Phase 1 leach pad process flow rate would operate at 700 gpm. Under the Phase 2 pad the process flow rate could increase to the full capacity of 1,000 gpm. Pregnant solution would be pumped through a series of carbon columns (Figure 2-9) where the precious metals would be adsorbed onto activated carbon. The recovery plant design includes a five-stage carbon column adsorption circuit that would be sized to handle 7.5 tons of carbon at a flow rate of 700 to 1,000 gallons per minute. Once the carbon is loaded with gold, the loaded carbon would be transferred into “Super Sacks”, sampled, and transported to GGI’s Glamis Marigold Mine for stripping, refining, and carbon reactivation. Reactivated carbon would be trucked back to the Project to continue the process. At a later date, GGI could develop a carbon stripping circuit and associated doré furnace at the Project within the Process area near the solution ponds (Figure 2-10).

2.2.4.4 Ore Crushing Facilities

If determined necessary to optimize precious metal recovery, ore would be hauled from the open pit to the crushing plant (Figures 2-1 and 2-11) for material size classification, then be loaded on haul trucks and transported to the heap leach facility, or placed on a conveyor system for delivery to the heap leach facility. The ore crushing facility would operate up to 60 hours per week, 52 weeks per year, at a rate of 400 tons per hour.

2.2.5 Roads

The Project Area is located at the northeast end of the existing public access road to an unnamed canyon due north of Carrara Canyon (Figure 2-1). A combination of new road construction and improvements to the existing public access road would be completed to accommodate mine traffic and public vehicle access to the Project Area. Signs, fencing, and gates would be used to separate public traffic from the mine equipment. Approximately 11 acres of surface disturbance would be associated with constructing or upgrading public access. Public access to the mine facilities would be restricted. Public access would require check-in at the mine office near the heap leach facility. This would provide the necessary safety precautions for the public due to the blasting and haul truck traffic that could be encountered within the Project Area. However, access to Carrara Canyon would remain available via roads south of the Project Area.

Mine haul roads between the open pit, waste rock dumps, ore processing facilities, and maintenance areas would be approximately 100 feet wide with maximum gradients of 10 percent. The haulage surface would be approximately 70 feet wide, plus 30 feet for safety berms and drainage ditches. Approximately 24 acres of disturbance would be associated with the haul roads.

2.2.6 Ancillary Facilities

2.2.6.1 Mine Site Service Facilities

Mine site service facilities for the Project would consist of a mine maintenance trailer (supply and parts), up to three explosive magazines, two prill bins, mine office trailers and miscellaneous storage containers. The mine maintenance trailer and miscellaneous storage containers would be located within the crushing facility area (Figure 2-10). The explosives magazines and prill bins would be located within the vicinity of the open pit. Tentative locations are displayed on Figure 2-1. A single-lane access road would be constructed to the powder magazine within a secured area of the project site, isolated from the public. Magazines would be secured in accordance with federal, state, and local regulations.

The mine office trailers would be located at the intersection of the public access road and the access road to the process facilities, or as an alternative option, they could be located near the solution ponds (Figure 2-1).

2.2.6.2 Buildings

All buildings on the project site would be portable and would be delivered and set up on-site. The following buildings would be required:

- Two - 20-foot by 60-foot office trailers; and
- Three - 20-foot by 40-foot storage trailers for supplies.

2.2.7 Growth Media Stockpiles and Berms

Growth media would either be placed directly on prepared slopes or would be stored for future use in intermediate berms or stockpiles. A berm is a small stockpile which is normally dozed in place by a track bulldozer. Berms are usually built with the growth media material salvaged from within footprints of open pit and waste rock dump areas. The berms would have a height of approximately 5 feet and slopes at the angle of repose. Berms may or may not be seeded depending on the projected life of storage. When the quantity of growth media is too great to be utilized as berms, it would be hauled to one of the stockpile areas (Figure 2-1) or to areas ready for reclamation. To minimize wind erosion and compaction, growth media stockpiles would not exceed 20 feet in height. Stockpile side slopes would not exceed 1.5H:1V to reduce the potential for water erosion and permit the establishment of protective vegetation cover.

Removal of growth media for the waste rock dumps would be conducted in phases to minimize disturbance at any one time. The growth media would be dozed down below the projected toe of the recontoured slope. Once the waste rock is placed and recontoured to approximately 3H:1V, the growth media would be dozed onto the recontoured slope. This sequence would continue throughout the construction of the waste rock dump starting with the lowest terrace first and progressing uphill.

2.2.8 Water Source and Supply

It is anticipated that maximum water needs would be approximately 125 to 175 gallons per minute (gpm). No water supply wells are located near the Project Area; therefore, all water would need to be delivered to the site from an off-site source. Water would be provided from an existing well located at T12S, R46E, Section 35 approximately 5 miles west of the Project Area (Figure 1-2). This well previously supplied water to the Barrick Bullfrog Mine. A pipeline would be constructed from the well to U.S. Highway 95 along an existing road and would be buried to a depth of 0.5 to 2 feet in the surface disturbance of the road. No new disturbance is associated with the construction of this portion of the pipeline. The pipeline would then continue under U.S. Highway 95 and connect with the south side of the Project access road, within the proposed road disturbance area. A pumping station, consisting of a single 60 mil HDPE lined storage pond, would be constructed adjacent to the Project access road. The pipeline would continue from the pumping station to the ore process facilities area. A portable tanker or storage tank would be placed in the area to store water for dust suppression, and a second portable tanker or storage tank would be placed in the heap leach facility area to store necessary process water.

The existing well is one of four wells in a well field that supplied up to 2,000 gpm to the Bullfrog Mine from the basin fill aquifer. The static water level is approximately 600 to 700 feet below ground surface at approximately elevation 2,600 amsl. The water well would supply only the processing facilities and dust suppression activity. Drinking water would be provided by commercial sources (bottled water) and transported to the mine site.

2.2.9 Electric Power

Electric power for offices, crusher and mine support systems would be provided by a power line extending from the existing power line located adjacent to US Highway 95 (Figure 2-1). A 1,500 kVa power line would be constructed adjacent to the Project access route to the mine office area and to the ore process facilities area. There would be three transformers, one each at the pumping station, heap leach facility and crushing facility. Emergency power would be supplied by generators located within the crusher facility area. Backup generators would also be available from the Glamis Daisy Mine, approximately 14 miles from the Project.

2.2.10 Drainage Control

A run-on control system would be constructed to efficiently route run-on around the waste rock dumps, crushing facility, and office complexes. Surface water resulting from precipitation events

would be, to the best extent possible, diverted via a run-on control system from entering any open pits. Small quantities of surface water could potentially enter the pits as run-off from haul roads entering the open pits. This system would reduce erosion that may be caused by concentrated flows generated by activities at the site. Channels and culverts would be sized to transport surface waters either to natural drainages or sedimentation structures (berms, ponds, etc). Sedimentation ponds/basins, if required, would be constructed to control and minimize the volume of eroded soil which could be transported off-site into natural drainages within the area.

2.2.11 Fuel Storage

Fuel for the diesel-powered equipment and diesel generators would be stored in three 10,000 gallon tanks (Figures 2-1 and 2-10) and appropriate 1,000 gallon tanks for satellite locations (i.e., office, crusher facility). Gasoline would be stored in one 6,000 gallon tank. All tanks would be installed above ground with a liner system consisting of a synthetic liner over compacted soils and a 12-inch layer of filter material would be placed on the synthetic liner to provide protection. The tanks would be surrounded by earth-filled berms to contain the volume of 110 percent of the largest tank.

2.2.12 Fencing

The ore processing facility would be enclosed by a four-strand barbed wire fence to exclude livestock and burros from the operating areas (Figures 2-1, 2-10, and 2-11). The process ponds would be enclosed by a six-foot chain link fence to prevent livestock, burros, and wildlife from accessing the ponds (Figure 2-10). Wire gates would then be installed as needed in low-traffic areas and metal hinged gates would be constructed in high traffic areas. The chain link fence would meet the requirements for excluding Desert Tortoise.

2.2.13 Communications

Portable FM radios and CBs would be used for site communications. Off-site communications would be established through the use of cellular phones.

2.2.14 Sanitary and Solid Waste Disposal

All sanitary wastes would be disposed of on-site, using septic tanks and leach field arrangement. Solid waste would be disposed of in an approved Class III landfill facility on site. The Class III landfill would be located in one waste rock dump and operated consistent with the Nevada Bureau of Solid Waste permit requirements. The BLM would be consulted regarding the landfill location prior to obtaining the NDEP permit.

2.2.15 Soil Bioremediation Pad

A hydrocarbon-contaminated soil bioremediation facility could be constructed adjacent to the crusher facility for management of hydrocarbon-contaminated soil in accordance with BMRR permit

requirements, convenience, and simplicity (Figure 2-10). Acreage for the bioremediation facility is included in the crushing facility footprint acreage. The facility would receive and treat hydrocarbon-contaminated soils resulting from small spills and releases that occur periodically from normal operations at the Project. The facility would utilize naturally occurring or introduced microbes and added nutrients to degrade the hydrocarbons in the contaminated soils. After bioremediation, the treated soil would be removed and utilized for revegetation, construction, or other approved applications.

GGI anticipates a minimum amount of contaminated soils, and therefore, the bioremediation facility would be minimal in size. The facility would consist of a lined, fully contained pad to accommodate the contaminated soil and ancillary equipment. The liner system would consist of a synthetic liner over compacted soils. A 12-inch layer of filter material would be placed on the synthetic liner to provide protection and to promote aeration and drainage.

2.2.16 Work Force

2.2.16.1 Construction Work Force

It is anticipated that Project construction would be minimal and short-lived. Road construction, crushing facility construction, and ancillary facility construction and/or installation would be minimal and intermittent. Employees would be recruited from the local (Beatty, Amargosa, Pahrump) work force and other GGI operations.

2.2.16.2 Operating Work Force

The Proposed Action is expected to employ up to 48 people year-round during full production. Approximately eight people would be directly involved with the open pit mining and heap leach operations while approximately six individuals would be involved with Engineering and Administrative functions. Management and supervision duties of the Project would be shared with the nearby GGI Glamis Daisy Mine operations, as needed.

2.2.17 Environmental Protection Measures

GGI has committed to a number of activities to minimize environmental effects of the Reward Project. These activities are described as follows.

2.2.17.1 Hazardous Materials

GGI would comply with applicable federal and state laws dealing with the use, storage, and disposal of chemicals, petroleum, and petroleum products. Hazardous wastes would not be generated within the Project Area. In the event that regulated materials, such as diesel fuel, were spilled, measures would be taken to control the extent of the spill, and the appropriate agency would be notified in accordance with applicable federal and state regulations.

2.2.17.2 Water Resources

All drill holes would be plugged in accordance with the guidance from the Nevada Division of Water Resources and the Nevada Administrative Code (NAC) 534.425 through 534.428. Storm water diversion and sedimentation controls would be constructed when necessary to control sediment and run-off.

During the first three years of operation, GGI would conduct neutralization tests on treated heap leach material. The tests would analyze the drain down, potential for contaminant release, and actual rinse volumes to meet closure specifications. This information would be used in developing the site-specific closure plan for the proposed heap leach facility. GGI would provide the BLM with the results of these tests.

2.2.17.3 Soil, Vegetation, and Wildlife

Prior to construction, GGI would salvage and stockpile all suitable growth media as practicable. Growth media would be used for concurrent reclamation to establish vegetation on site as facility construction allows. Cacti would be transplanted, or in cooperation with the BLM and State of Nevada, made available to the public prior to mine development.

Chuckwallas and gila monsters observed at the time of surface disturbing activities would be captured and removed from the proposed area of disturbance to adjacent undisturbed habitat.

Solution ponds would be fenced to exclude terrestrial wildlife access and fowl balls or netting would be used at the ponds to discourage avian use/access.

2.2.17.4 Noxious Weeds

Weed-free seed would be used for interim and final reclamation revegetation to prevent the introduction of noxious weeds to the Project Area. An annual noxious weed inventory of all surface disturbance would be conducted to provide early detection of noxious weed establishment. If noxious weeds are observed, a site-specific treatment plan would be developed in cooperation with the BLM.

2.2.17.5 Air Quality

Fugitive dust from traffic on the haul roads would be controlled by regular application of water and binding agents as practicable. Particulate emissions from the crushing operations would be controlled using standard emission control techniques such as fogging or pneumatic sprays. Mitigation of fugitive emissions caused by mining activities (blasting, waste rock removal, ore and waste rock hauling, ore and rock dumping, and wind erosion) could be achieved by the following activities:

- Blast hole optimization;
- Minimizing drop heights during ore and waste rock removal and transfer;

- Prompt reclamation and revegetation of exposed areas; and
- Water application or use of approved chemical binders on haul roads.

GGI would obtain air quality permits from the Nevada Department of Environmental Protection (NDEP). This could include permits for the fuel combustion devices, fuel storage tanks, and fugitive dust emissions. All process components, by design, would meet State of Nevada minimum design criteria.

2.2.18 Reclamation

GGI proposes to disturb up to 214 acres within the Project Area. Most of the disturbance would result from the development of the Reward open pit, construction of three waste dumps, and construction of the ore processing facilities. Haul roads, facility sites, and public access would also require surface disturbance. Concurrent and post-mining reclamation would follow procedures similar to those utilized at the GGI Glamis Daisy Mine. The goal of the reclamation plan is to restore a productive vegetative cover to disturbed areas to meet post-mining land use objectives, which include wildlife habitat, recreation, and mineral exploration. GGI intends to practice concurrent reclamation, to the extent it is reasonably practicable, during the life of the Project. Reclamation of mining and exploration operations may include the following: recontouring, ripping, stabilization, seedbed preparation, growth media application, and revegetation.

In general, the Reclamation Plan includes the following:

- Measures for the protection of wildlife, livestock, and the public;
- Measures to minimize erosion and mass failure potential;
- Regrading of selected cut-and-fill slopes; and
- Where feasible, measures to allow for the resumption of pre-mining land uses.

The reclamation procedures proposed for the Reward Project incorporate these six basic components:

- Establishment of stable topographic surface and drainage conditions that are compatible with the surrounding landscape and serve to control erosion;
- Establishment of soil conditions most conducive to establishment of a stable plant community through stripping, stockpiling, and reapplication of suitable growth media;
- Revegetation of disturbed areas to establish a long-term productive biotic community compatible with proposed post-mining land uses;
- Consideration of public safety through stabilization, removal, and/or fencing of structures or land forms that could constitute a public hazard;
- Minimization of the outward regrading or reshaping of slopes to reduce further impacts to undisturbed wildlife habitat; and
- Consideration of the long-term visual character of the reclaimed area.

Not all disturbed areas would be revegetated. Steep walls and slopes of open pits are a residual impact of mining which cannot be revegetated but can provide habitat for raptor and passerine wildlife species. All other slopes would be shaped for reclamation and, depending on the type of material, erodibility, and the practical considerations of the mining process, overall slope grades would range from near vertical (e.g., pit walls) to near horizontal (e.g., road surfaces). After closure, the pit high walls would be left in a stable configuration, subject to natural processes. The waste rock dumps would be recontoured to an overall slope of 3H:1V. The proposed post-mining topography is depicted in Figure 2-2. Final grading of cuts and fills and of waste rock dumps would create undulating land forms that would be stable, would not allow for pooling or ponding, and would blend with the surrounding undisturbed topography. Final grading would minimize erosion potential and additional surface disturbance, and would facilitate the establishment of post-mining vegetation. Straight lines would be altered to provide contours which would be visually and functionally compatible with the surrounding terrain.

Seedbed preparation would take place after grading, stabilization, and growth media placement and would consist of the following:

- Loosening compacted surfaces and leaving them in a rough condition by contour ripping, followed by discing or other mechanical means;
- Using tillage implements for all areas to be reclaimed that can safely be worked by surface equipment to create a friable surface with favorable bulk density; and
- Applying soil amendments and discing, raking, or treating to incorporate the amendments into the growth media. The prepared surfaces would be seeded using a range land drill or a broadcast seeder, depending on the working area and steepness of slope.

Revegetation activities would continue to be conducted in the late fall to take advantage of winter precipitation. For broadcast applications, the seeder would be followed by dragging with a light chain or other means to provide some soil cover of the seed. Whenever possible, a range land drill would be used for more effective seeding. The rocky terrain and soil materials in the Project Area could dictate the use of broadcast seeding.

GGI would attempt, through the selection and development of adequate seed mixtures of grasses, forbs, and shrubs, to reestablish native species on-site. The proposed reclamation seed mix is presented in Table 2-6. The immediate result may not be a diverse plant community due to short term weather conditions which limit moisture. The seed mixture could be adjusted to develop different plant communities in successive seedings.

Reclamation would be initiated when individual mine components are no longer required for mine operations or when site closure begins. Removal of facilities, rough grading, and scarifying activities could occur at any time during the Project. Concurrent reclamation of select disturbed areas could occur as practicable. When the ore reserves are exhausted, mining operations would be terminated. Heap leach operations would terminate after uneconomic recovery rates were reached. It is

Table 2-6: Proposed Reclamation Seed Mix for the Project

Species		Drill Rate[1]	Broadcast Rate[1]
Fourwing saltbush	*Atriplex conescens*	4	6
Nevada ephedra	*Ephedra nevadensis*	3	4
Indian ricegrass	*Oryzopsis hymenoides*	2	4
Desert needlegrass	*Stipa speciosa*	1	1.5
Globemallow	*Sphaeralcea ambigua*	0.5	1
Desert marigold	*Baileya multiradiata*	0.5	1
White bursage	*Ambrosia dumosa*	3	5
At least three of the following species would be chosen after trial seedings:			
Winterfat	*Ceratoides lanata*		
Spiny hopsage	*Grayia spinosa*		
Virgin Mountain encelia	*Encelia virginensis*		
Flat-top buckwheat	*Eriogonum fasciculatum*		
Shadscale	*Atriplex confertifolia*		
Desert trumpet	*Erogonum inflatum*		
Creosote	*Larrea tridentata*		
Total for all species chosen in above section		6	9

[1]pounds per acre PLS

foreseeable that heap leaching activities would remain active after mining activities have stopped, due to the length of time required to complete leach and rinsing cycles.
Reclamation of the landfill, if constructed, would be initiated once the site was no longer needed and would be closed as part of the waste dump reclamation. The site would be buried with waste rock to a depth of at least 20 feet. Growth media would be distributed, followed by recontouring and seeding in conjunction with the rest of the waste dump reclamation.

The closure of the heap leach facilities would require treatment of the spent heaps to neutralize the weak acid dissociable (WAD) cyanide available in the ore and lower the pH. GGI proposes to neutralize the spent heaps by rinsing with fresh water and other criteria as required by Nevada water pollution control regulations. The ore to be extracted from the Reward Pit is similar to the ore at the

Glamis Daisy Gold Mine West Zone Pit. Preliminary column rinse tests of the West Zone Pit ore indicate that the ore should rinse readily and minimum volumes of rinse solution should be necessary to meet the current maximum constituent levels. GGI proposes to conduct neutralization tests of the spent heap leach material from the Reward Pit during the first two years of operation. Results of these tests would be used to determine the rinse volumes required for neutralization. Carbon filtration of the solution may also be conducted to reduce constituent levels.

Treatment of the rinseate by neutralization using a chemical means may also be utilized. This option would be implemented if field samples indicate that rinsing with fresh water alone, or the combination of fresh water rinsing and carbon filtration, is insufficient treatment to meet requirements of the water pollution control regulations. This treatment would be essentially the same as the fresh water rinsing described below, only chemicals would be added to the water to bind with the elevated constituents to render them inactive.

Fresh water rinse would only be applied to a portion of the heap at any given time because of the quantity of water required and the available supply system. The active rinsing would be alternated with “resting” periods of up to several months duration, during which the heap would be allowed to dry. The resting period would allow cyanide solution time to migrate from interstitial cavities which may not receive active rinse solution. The rinsing and resting would continue for the minimum duration necessary until the heap is stabilized. The rinsng and resting periods would be conducted alternately throughout the heap during the period of neutralization. Therefore, at any given time, some portion of the heap would be receiving the fresh water rinse and some portion would be drying. Rinseate draining from beneath the heap would be routed to the lined solution ponds and either recirculated onto the heap for rinsing or allowed to evaporate. During active closure operations, all monitoring dictated by permit requirements would continue. The leak detection systems for the pads and ponds would be inspected on a daily basis.

The application rate of fresh rinse water to the heaps would be determined by the permeability of the heap, by field experience gained during leaching operations, and from the results of any column rinse tests or other such studies that may be performed during the later stages of project operation. It is anticipated that the application rate of fresh water would probably be similar to the leaching rate.

Criteria for considering the spent heaps successfully neutralized by rinsing would be as per NAC 445A.430.1. The effluent rinse water must have WAD cyanide level less than 0.2 mg/l and a pH between 6.0 and 9.0. Contaminants in any effluent would not degrade waters of the state.

Samples of the rinseate draining from the heap would be collected and tested on a periodic basis. Rinsing would continue until the rinseate meets the requirements of the NDEP for WAD cyanide and pH. At this time rinsing would cease and the heap would be allowed to drain. Representative samples across and through the heap would be collected and subjected to NDEP meteoric water mobility tests. If the results of these tests indicate that the spent heap does not have the potential to degrade the Waters of the State as a result of leaching under normal meteoric conditions, the heap would be considered chemically stabilized. If the tests indicate that contaminants may be mobilized in

sufficient quantity to degrade the Waters of the State, rinsing of the heap would continue, or, upon consultation with NDEP, other methods would be considered to stabilize the heap, as per NAC 445.430.3. State regulations (NAC 445.430.2) also provide for a variance from the neutralization requirements provided that the rinsed heap does not contain levels of contaminants that are likely to become mobile and degrade waters of the state under conditions that would exist at the site, or the spent ore is stabilized in such a fashion as to inhibit meteoric waters from migrating through the material and transporting contaminants that have potential to degrade waters of the state.

GGI would also consider land application and leach field construction. The use of this option would be selected if analysis of the attenuation capacity of the native soils and clays, and column tests on the heap leach material determine that there are any constituents that would remain after fresh water rinsing and/or chemical treatment. Currently, the data necessary to determine the efficiency of this option are not available.

Reclamation of the rinsed and neutralized heap would be conducted as follows:

- The side slopes of the heap would be regraded to the 3H:1V slope as described previously. Perimeter berms and ditches would be left intact and covered during regrading. The liner and drain pipes would be left under the stabilized heap. The heap would be resurfaced with growth media, contour ripped, and seeded to revegetate suitable species that are specified in the reclamation plan;

- All chemicals or reagents would be removed, along with their empty containers, and disposed of consistent with appropriate state and federal regulations;

- All surface plumbing and exposed conduit would be removed and disposed of properly;

- Following establishment of vegetation, fencing would be removed;

- Roads would be recontoured and ripped to a depth of approximately 1 foot or scarified, as necessary, and seeded. Water bars may be incorporated if slopes on the reclaimed roads threaten to cause undue erosion;

- All buildings, tanks, and equipment associated with the leaching facility would be removed and cement foundations broken up and buried in place; and

- All other disturbed areas would be regraded, surfaced with growth media, and seeded with the specified seed mix.

Erosional stability analysis was conducted for the Reward Project. The analysis indicated that the prepared slopes of the heap leach should perform as well as the native slopes within the area with the exception of the 3H:1V faces of the heap immediately after contouring. However, within five years after closure, even these slopes are predicted to perform well as vegetation becomes

established. The analysis for the heap leach pad is generally considered conservative because revegetation is likely to occur sooner than the five year limit used in the analysis.

As an optional closure procedure, GGI may employ a method utilized at the REN Mine in Elko County, Nevada. After active heap leaching has ceased, the spent heap may be sprayed with fresh water to reduce the level of cyanide in the heap. After a period of time for drying of the heap, the surface area of the pad would be expanded by placing wings of synthetic liner material on one (1) or both sides of the heap. The width of the wings would depend on the height and dimension of the heap. The surface along the sides of the heap would be sloped to create a V-ditch or collection ditch on the outside of the pad area. The surface area would be compacted and covered with low permeability natural materials. A synthetic liner (40-mil HDPE or equivalent) would be placed over the wing base and would be tied in to the present liner system of the heap. The present ditch and liner of the existing heap would be protected from puncture by using geotextile and/or gravel placed over the synthetic liner.

Once the wings are in place, spent ore from the heap would be dozed down to reslope the heap to a minimum of 3H:1V slope. Material from the heap would cover the exposed synthetic liner surface area, including the V-ditch and outer slope of ditch. Care would be taken to prevent coarse rocks from falling onto the liner system. Punctures identified would be repaired. A collection may be provided in the outer V-ditch as necessary to promote flow. Once the final slope of the heap has been established, the heap surface would be terraced to prevent drainage down the heap and ripped with a bulldozer to provide percolation through the rock on the heap. All material from the heap would remain on synthetic liners.

The heap would be seeded with various native and selected species, to promote bacterial growth that would stabilize the heap. Rinsing with fresh water would also promote growth of vegetation on the heap and the development of natural bacterial growth. A dedicated pond would be used for storage of solution from the heap, and may continue to be filtered in carbon to remove undesirable constituents in the heap. The rinsing cycle would continue until rinseate criteria are met. Periodic rest cycles, such as winter months, may be planned. During these periods, the level of monitoring may be reduced, as approved. Once the heap has been stabilized, and flows from the heap are lowered in volume, a passive bioreactor may be created to treat solution discharging from the now successfully vegetated heap. The bioreactor would act similar to a sewage treatment leach field, promoting growth of bacteria and natural filtration of solution. Reclamation of the stabilized heap would follow the steps outlined above for the fresh water rinse method, including ripping of the terraced slopes, application of growth media, and seeding with the final reclamation seed mix.

GGI may also consider as an option for heap leach closure, a newly developed technology that is currently being conducted at the Glamis Dee Gold Mine in Eureka County, Nevada. This method involves a proprietary chemical/nutrient treatment using a combination of benign alcohols, sugars, or fatty acids to change the re-oxidation potential in the heap. These nutrients would be injected into the heap subsurface to de-oxygenate the heap and form bio-reductive zones for the precipitation and removal of reducible species from solution. In this manner, cyanide, nitrate/nitrite, and all metal

constituents can be altered or immobilized in the heap. This treatment, combined with an effective evapotranspiration cover (nominal six inches) would result in meeting drinking water standards for all constituents except for salts and total dissolved solids. These constituents of the low volume, high quality effluent can readily be dealt with in a simple leach field unit.

Under this method, the heap leach would be chemically treated as soon as active heap operations have ceased. After chemical treatment, the slopes would be reduced, and the evapotranspiration cover would be applied. The drain down solutions would be land applied in a constructed leach field. The ponds would be closed and reclaimed. The low precipitation in the area may not require the use of a leach field for long-term drain down, but is included as part of the method and could shorten the closure period.

GGI would develop a heap closure plan for submission to BMRR and BLM, based on rinse tests, meteoric water mobility tests, and column tests. Soil testing for attenuation capacity would be conducted if land application and leach field construction are included in the heap closure plan.

Reclamation of the soil bioremediation pad would begin after all the contaminated soil has been treated and removed. The soil bioremediation pad would be reclaimed by removing the filter material to the heap leach pad. The synthetic liner would then be folded in on itself and the exposed compacted soil would be ripped. The pad area and liner would be buried with growth media, contoured, and seeded.

2.3 No Action Alternative

In accordance with BLM guidelines (H-1790-1, Chapter V), this EA evaluates the No Action Alternative. The objective of the No Action Alternative is to describe the environmental consequences that would result if the Proposed Action is not implemented. The No Action Alternative forms the baseline from which the impacts of all other alternatives can be measured.

Selection of the No Action Alternative would generally be inconsistent with the BLM multiple use mission and policy of making public lands available for a variety of uses as long as these uses are conducted in an environmentally sound manner. The subject lands were not withdrawn for any special use and were open, unappropriated lands when unpatented mining claims were located.

Under the No Action Alternative, GGI would not develop the Proposed Action. GGI would continue operations at the Glamis Daisy Mine, as previously approved. This would result in Glamis Daisy Mine's inability to maintain the current level of employment. The No Action Alternative would result from the BLM's disapproval of GGI's *Reward Project Plan of Operations and Reclamation Plan.*

2.4 Alternative Considered but Eliminated from Detailed Analysis

GGI originally developed a plan that proposed processing the leach ore at the Glamis Daisy Mine heap leach facility. Ore was to be hauled over highway US 95 from Reward to Daisy and no ore processing was to occur at the Reward Project. However, the Nevada Department of Transportation (NDOT) expressed reservations regarding this proposal due to the traffic volume and ingress of slow moving trucks onto Highway 95. Mitigation to relieve these concerns included major highway modifications to create turn and storage lanes, as well as an acceleration lane. These mitigation measures could not be designed, permitted, and constructed in time to meet the mining schedule. Glamis Gold Inc. withdrew the Plan of Operations in favor of a modified Plan of Operations that eliminated the haulage to Glamis Daisy Gold Mine. BLM made a preliminary evaluation of the two proposals and did not find a compelling reason to carry the original proposal forward for detailed analysis due to the public safety issue and the lack of resource issues. The issue of public safety remained due to the number of trucks entering and exiting the highway over a short distance, even with the highway modifications. The differences in environmental consequences of processing the ore at the Daisy Mine versus processing at the Reward Project were considered minimal. Surface disturbance between the two options was similar when the road expansion for the storage and turn lane, and the expansion of the Daisy Mine heap leach pad were compared to the proposed 26 acres of disturbance for the Reward heap and ore processing facility disturbance. Fugitive dust during hauling, and combustion products of fossil fuels would be greater as a result of hauling the ore to the Glamis Daisy Mine. No resource issues were identified in the preliminary analysis of in this environmental analysis that required mitigation by processing ore at the Glamis Daisy Gold Mine, and public safety was a compelling reason not to implement the haulage option. Therefore, this alternative was not considered for detailed analysis and the Proposed Action was modified to include the development of ore processing facilities at the Project.

BLM does not ascribe the method or manner in which a claimant would develop a mineral property. It is GGI's responsibility to develop the mineral property and to ensure that development is in compliance with all applicable requirements, laws and regulations.

3 AFFECTED ENVIRONMENT

The Affected Environment for the Proposed Action and the No Action Alternative are the same. Therefore the following discussion is applicable to both.

The following critical elements of the human environment have been determined to be either not present or are not affected by the Proposed Action or Alternatives and are, therefore, not further addressed in this Environmental Assessment:

- Areas of Critical Environmental Concern;
- Farm Lands (prime or unique);
- Flood plains;
- Noxious Weeds;
- Paleontology;
- Wastes (hazardous or solid);
- Wetlands/Riparian Zones;
- Wild and Scenic Rivers;
- Wilderness; and
- Environmental Justice.

3.1 Land Use and Access

No rights-of-way exist on the area; however, public access to the area is via US Highway 95 from Beatty, Nevada, to an unnamed gravel road approximately 8 miles south of Beatty. The gravel road extends approximately 3 miles to an unnamed canyon due north of Carrara Canyon.

3.2 Soils

Soil survey data for the Project Area is described in the unpublished, preliminary soil survey for the southwest part of Nye County, Nevada (National Resource Conservation Service [NRCS] 1995). Soils near the Project are described in Table 3-1. Each soil association is composed of one or more individual soils that have specific characteristics that allow them to be distinguished from other association soils.

Site-specific soils within the Project Area are a mixture of colluvium and talus. Slopes and hilltops have extensive bedrock exposures. Drainages contain coarse-grained alluvium consisting of a poorly sorted, gravelly, skeletal, dark grayish brown silt loam with angular to subangular gravel, cobbles, and boulders. Soil horizons are weakly developed. A moderately well-developed desert pavement covers stable surfaces. None of the soils identified by the NRCS meets the criteria to be considered prime or unique farmlands. The quality of these existing soils for reclamation purposes is considered poor. Table 3-2 presents soils specific to the Project Area and projected quantities or stockpiled growth media. Figure 3-1 is a map showing the location and extent of the soils described in Table 3-2.

Table 3-1: Soils in the Vicinity of the Project Area

NRCS Map Unit	Soil Series & Surface Texture	Classification	Reaction	Permeability	Available Water Capacity in/in	Hydrologic Group	Water Erosion Hazard	Wind Erosion Hazard	Landscape Position/ % Slope	Depth To Bedrock	Topsoil Suitability
2053	Yermo very gravelly sandy loam	Typic Torriorthents loamy-skeletal, mixed, calcareous thermic	Moderately alkaline	Moderate	0.06 to 0.08	B	Slight	Slight	Fan collars, side slopes of fan remnants 15% to 30%	> 60”	Poor
	Greyeagle very gravelly sandy loam	Typic Durargids loamy-skeletal, mixed thermic	Moderately alkaline	Moderately rapid	0.03 to 0.10	D	Slight	Slight	Summits of fan remnants 8% to 15%	8 – 14” Hardpan	Poor
	Arizo very gravelly, sandy loam	Typic Torriorthents sandy-skeletal, mixed thermic	Moderately alkaline	Very rapid	0.04 to 0.06	A	Slight	Moderate	Inset fans 4% to 15%	> 60”	Poor
2054	Yermo very gravelly sandy loam	Typic Torriorthents loamy-skeletal, mixed, calcareous thermic	Moderately alkaline	Moderate	0.06 to 0.08	B	Slight	Slight	Fan collars, side slopes of fan remnants 15% to 30%	> 60”	Poor
	Arizo, very gravelly, sandy loam	Typic Torriorthents sandy-skeletal, mixed thermic	Moderately alkaline	Very rapid	0.04 to 0.07	A	Slight	Moderate	Inset fans 4% to 15%	> 60”	Poor

NRCS Map Unit	Soil Series & Surface Texture	Classification	Reaction	Permeability	Available Water Capacity in/in	Hydrologic Group	Water Erosion Hazard	Wind Erosion Hazard	Landscape Position/ % Slope	Depth To Bedrock	Topsoil Suitability
2081	Rock Outcrop	------	------	------	------	------	------	------	------	------	------
	St. Thomas very cobbly loam	Lithic Torriorthents loamy, skeletal, carbonatic thermic	Moderately alkaline	Moderately rapid	0.04 to 0.08	D	Moderate	Slight	Side slopes of hills 30% to 75%	4” to 20”	Poor
	Tecopa extremely gravelly sandy loam	Lithic Torriorthents loamy-skeletal, mixed, calcareous thermic	Moderately alkaline	Moderate	0.03 to 0.06	D	Moderate	Slight	Side slopes of hills 15% to 75%	2” to 10”	Poor
2301	Rock Outcrop	------	------	------	------	------	------	------	------	------	------
	Tecopa extremely gravelly sandy loam	Lithic Torriorthents loamy-skeletal, mixed, calcareous thermic	Moderately alkaline	Moderate	0.03 to 0.06	D	Moderate	Slight	Side slopes of hills 15% to 75%	2” to 10”	Poor
	Haleburu extremely gravelly sandy loam	Lithic Torriorthents loamy-skeletal, mixed, thermic	Moderately alkaline	Moderately rapid	0.03 to 0.07	D	Moderate	Slight	Side slopes of hills 15% to 75%	4” to 14”	Poor

The projected cubic yards presented in Table 3-2 represent estimates based on the unpublished soil survey. Actual field experience indicates that the soils are generally shallow and that there is likely to be less growth media available for stockpiling than provided in these estimates.

3.3 Geologic Resources

The Project Area is located within the Great Basin region of the Basin and Range physiographic province, which is characterized by elongated, north-trending, fault-bounded mountain ranges separated by alluvial valleys. The Project Area is bounded to the east by Bare Mountain, which is composed of late Precambrian to late Paleozoic sedimentary rocks that have been subjected to repeated episodes of folding and faulting. The western edge of the Project Area is within the Amargosa Desert, the surface of which is Quaternary alluvium.

Geologic formations in the Project Area consist of late Precambrian to late Paleozoic sedimentary rocks of the Bare Mountains that have been intensely deformed by folding during the late Paleozoic or Mesozoic, intense thrust and lateral faulting in the Mesozoic, and normal faulting in the late Tertiary to Holocene (Cornwall 1972). The Paleozoic sediments are intruded by monzonite porphyry, pegmatites, and Tertiary volcanic rocks, (Ball 1907; Hill 1912; and Stoddard 1932) (Figure 3-1). Topographic relief of the Project Area ranges from a low of 2,930 feet to a high of approximately 4,420 feet amsl. The geomorphology of the Project Area is generally characterized by massive alluvial fans extending downslope from the Bare Mountains.

The Reward deposit is a shallow ore deposit that is bounded on the west by the Stirling Formation. This is a white massive quartzite of the locally recognized Juhl member which forms the footwall of the ore zone. The bulk of the ore deposit occurs within the Wood Canyon Formation. This formation can be further distinguished into these three units: an interbedded quartzite, phyllite, and minor schist; quartzite; and a silicified sandy and silty dolomite. The Bonanza King Dolomite and Carrara Formation overlie the Wood Canyon Formation in the area of the proposed open pit. However, these carbonate rocks are also overlain by the Wood Canyon Formation at the north end of the proposed open pit. The two carbonate units account for only a minor portion of the volume of material in the proposed open pit. The surface of the Project Area is composed of Quaternary alluvium and colluvium which consist mainly of limestone, marble, and dolomite fragments transported by gravity from the Carrara Formation and Bonanza King Dolomite exposures in the bluff located immediately east of the ore zone.

Table 3-2 Soils Specific to the Project Area

Facility	Soil Map Unit	Soils Series & Surface Texture	Depth Of Topsoil (In)[1]	Acres	Volume (Cubic yards)
Open Pit	2301	Rock Outcrop; Tecopa extremely gravelly sandy loam; Haleburu extremely gravelly sandy loam	5	35.5	23,864
	2053	Yermo very gravelly sandy loam; Greyeagle very gravelly sandy loam; Arizo very gravelly sandy loam.	8	13	13,982
	2081	Rock Outcrop; St. Thomas very cobbly loam	2	1.5	403
	Subtotal			**50**	**38,249**
West Waste Rock Dump	2301	See Map Unit 2301 above	5	17	11,428
	2053	See Map Unit 2053 above	8	9	9,680
Southeast Waste Rock Dump	2053	See Map Unit 2053 above	8	19	20,436
South Waste Rock Dump	2301	See Map Unit 2301 above	5	10	6,722
	2053	See Map Unit 2053 above	8	12	12,907
	Subtotal			**67**	61,173
Roads	2053	See Map Unit 2053 above	8	35	37,644
	Subtotal			**35**	37,644
Process related (Heap, Crusher, & Ancillary)	2301	See Map Unit 2301 above	5	4	2,689
	2053	See Map Unit 2053 above	8	43	46,249
	Subtotal			**47**	**48,938**
	TOTAL[2]			**199**	**186,004**

[1]Approximate depth of topsoil, based on soil survey by Natural Resource Conservation Service.

[2]Total does not include the exploration acreage as it has not yet been determined in which soil type(s) the exploration would occur.

3.3.1 Seismic Activity

No fault scarps, which would suggest recent seismic activity, have been identified in the immediate Project Area. The seismic zone map in the Uniform Building Code shows the Project Area as zone 2B on a scale ranging from one (indicating less damage expected) to four (indicating the most damage expected). The most recent seismic event in the area occurred on July 31, 1995, approximately 19 miles northeast of Beatty, Nevada with a magnitude of 4.2 on the Richter scale. The largest recorded seismic event within 30 miles of the Project Area occurred in 1976 and measured 4.9 on the Richter scale (BLM 1996).

3.3.2 Paleontological Resources

No scientifically significant paleontological resources have been identified in the immediate area of the Project, however, fossils do occur in the region of the Bare Mountain Range (Cornwall 1972).

3.4 Air Quality

The Project Area is located in a semiarid region, with a climate characterized by warm, dry summers and cool winters. The temperature ranges from an average daily minimum of 36 ^{o}F in February to an average daily maximum of 99 ^{o}F in July. The annual precipitation is approximately 4 inches per year.

The Project Area is located within the Amargosa Desert Air Basin as designated by the Nevada Bureau of Air Quality (BAQ). The basin is designated as an “unclassified” basin relative to attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants (particulate matter less than 10 microns, carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone and lead). An unclassified area is one for which sufficient ambient air quality data are not available to determine attainment. Unclassified basins are managed as if they are in attainment.

Baseline air quality and meteorological conditions at the Project Area were estimated from the closest air quality monitoring facility located at the Bullfrog Mine in Rhyolite, Nevada (approximately 9 miles to the northwest). The two particulate matter less than 10 microns (PM_{10}) samplers located at the Bullfrog Mine site were used to collect air quality and meteorological data from April 1992 through June 1995. The PM_{10} samplers operated on a standard six day sampling schedule and the meteorological sensors operated on a continuous basis. The PM_{10} samplers were calibrated on a quarterly basis and the meteorological sensors were calibrated every six months as per State of Nevada guidelines. The PM_{10} data collected indicated that the ambient air quality meets the state and federal PM_{10} 24-hour ambient air quality standard of 150 micrograms per cubic meter (ug/m^3) and annual PM_{10} state and federal standard of 50 ug/m^3. There were no exceedances for the 24-hour or annual PM_{10} standard. Table 3-3 presents a summary of the ambient air quality data collected at the Bullfrog Mine site from April 1992 through June 1995.

Table 3-3: Summary of Bullfrog Mine 24-Hour PM_{10} Data Period, April 1992 Through June 1995

Sampler Number	Maximum Concentration (ug/m^3)[1]	Second Highest Concentration (ug/m^3)	Arithmetic Average (ug/m^3)	Number of Samples
0	50	48	18.3	188
2	55	54	18.4	188

[1] ug/m^3 = micrograms per cubic meter

3.5 Cultural Resources

A record/file search was conducted for the Project Area and revealed that no historic properties currently listed on or eligible for inclusion in the National Register of Historic Places (NRHP) are located within or adjacent to the Project Area. Two Class III level inventories were conducted within the Project Area. The first inventory covered the proposed open pit, dump, and road areas. A total of five historic archaeological sites and six isolated occurrences were identified and recorded as a result of the first cultural resource investigation of the Project Area (White 1998). The sites were all mining related except for one industrial building site. None of the sites or isolates have been recommended for listing in the NRHP.

The second inventory covered the proposed water supply line, heap leach facility, crushing facility, and ancillary facilities areas. This inventory identified five additional cultural resource sites and 16 isolated occurrences. The newly recorded sites include a prehistoric lithic scatter with four lithic reduction loci, a prehistoric lithic scatter with two lithic reduction loci, a portion of the historic Tonopah & Tidewater Railroad grade, a mine shaft, and a portion of historic road (White and Wedding 1999). None of the newly recorded sites have been recommended as eligible for inclusion in the NRHP.

3.6 Native American Religious Concerns

The Reward Project was evaluated for traditional cultural properties and cultural resource sites. The level of evaluation of the area of project effect was commensurate with the size and scope of the undertaking. A review of the existing data revealed no information concerning prehistoric sites. There was no ethnographic information found to indicate a potential for traditional cultural properties or any other significant prehistoric sites. An intensive on-the-ground inventory was conducted of the entire area of potential effect, and as a result, with the exception of a non-significant lithic scatter, all the sites identified were historic. There was nothing to indicate the potential for sensitive Native American sites.

3.7 Water Resources

3.7.1 Surface Water

The Bare Mountains form a portion of the northeastern perimeter of the Amargosa Desert Hydrographic Basin. This Hydrographic Basin is also bounded by the Bullfrog Hills to the north, the Specter and Last Chance ranges to the east, the Grapevine and Funeral Mountains of California to the west, and the Greenwater Range to the south (Kilroy 1991). Intermittent streamflow from these ranges that form the perimeter of the Amargosa Desert discharge water to tributaries of the Amargosa River, which traverses the desert and is a dry wash most of the year.

No perennial streams or springs are located within the Project Area; however, there is evidence of ephemeral streams. Several steep incised tributary canyons, including Carrara and Tungsten Canyons, indicate stream flow originating from storm events. The amount of incision is due in part to the steep topographic gradients along the alluvial fans between the canyons and the valley floor (Amargosa Desert) which lie approximately 1,000 feet lower and 2 miles southwest of the Project. During extended storm events, surface run-off may flow from these drainages to the Amargosa River. Surface drainage for the proposed Reward Project Area is shown on Figure 3-2.

Available streamflow data for the Amargosa River, near the Amargosa Narrows, are not representative of the amount of precipitation recorded at the two precipitation gauges in the region. Precipitation along the river generally averages 4 inches per year and makes the Amargosa Desert one of the driest places in the United States (Kane et al. 1994). However, streamflow measurements for the ephemeral Amargosa River indicate that large storms in the nearby mountain ranges can yield large streamflows. In July 1990, peak flows of the Amargosa River reached approximately 83,000 gpm, measured three miles south of Beatty, Nevada (Kane et al. 1994). The Federal Emergency Management Agency (FEMA) has designated the Project Area Zone X, or an area of moderate flood hazards because of such storm events.

Surface water quality in the area is not well known due to the fact that most local drainages in the area are dry. The closest springs to the Project Area are located within the Amargosa Narrows south of Beatty along US Highway 95 and at Specie Spring which is located in Oasis Valley on the northeast flank of the Bare Mountains, approximately 3 miles northeast of the Project Area. Water quality analyses for several springs located along Amargosa Narrows and within Oasis Valley to the northwest indicate total dissolved solids range from approximately 150 to 800 mg/l. Discharges from individual springs in this area range up to 400 gpm (McKinley et al. 1991).

3.7.2 Ground Water

The Project Area lies within the Amargosa Desert Hydrographic Basin. of the Death Valley Flow System, which consists of 30 individual hydrographic basins within a 16,000 square-mile area of the Great Basin Physiographic Province (Harrill et al. 1988). The hydrographic basins are interconnected through a 13,000 to 16,400 foot-thick sequence of Paleozoic carbonate rock, which forms the "carbonate aquifer." According to Winograd and Thordarson (1975), this carbonate aquifer is confined by underlying Precambrian and Cambrian formations and by overlying late Paleozoic limestone and shale. The Project Area is located along the east edge of this hydrographic basin. A potentiometric map for the Project Area is shown on Figure 3-3.

The exact elevation of the groundwater table within the Project Area is not known; however, it is well beneath the level of the proposed pit development. The inferred potentiometric surface is approximately 2,600 feet amsl. More than 290 exploration drill holes in the Project Area failed to encounter the carbonate aquifer between the surface and elevation 3,400 feet amsl. Figure 3-4 depicts the hydrogeologic section through the Reward Pit with the estimated ground water elevation. GGI (Rayrock) drilled a well in 1997 at the northern end of the Bare Mountains, approximately three miles north of the Reward Project. This well was drilled into the carbonate aquifer at approximately 2,100 feet amsl, or 700 feet below the ground surface at this location (HSI Geotrans 1997).

A second, more localized basin fill aquifer is known to exist west of the Project Area at the lower elevations of the Amargosa Desert Hydrographic Basin (Winograd and Thordarson 1975). This unconfined aquifer occurs in the alluvium or basin-fill deposits located in structural depressions between the mountain ranges, that consist of unconsolidated to partly consolidated deposits derived from adjacent mountains. The deposits may reach a thickness of 10,000 feet (Thomas et al. 1986). Continuous groundwater flow systems are generally formed by hydrologically connected basin fill reservoirs and underlying carbonate rocks or structural features. Within the Amargosa Desert, the basin fill includes alluvial fan deposits, stream deposits, and dune sand. Depth to groundwater in the area of the existing water well proposed for water supply for the Reward Project is between 600 and 700 feet below ground surface (bgs) with well yields of approximately 200 gpm. Groundwater movement within the Amargosa Desert basin fill is generally southeastward along the axis of the desert (Walker and Eakin 1963). Groundwater discharge from the Amargosa Desert Valley occurs predominantly along a fault-controlled, 10-mile spring line at Ash Meadows, about 30 miles southeast of the Project Area.

The alluvium in the area of the existing well is deposited in a wedge against steeply dipping bedrock. The surrounding geology forms a hydrologic boundary to the north, northwest, and southwest of the well. A fault to the east of the well provides another hydrologic boundary. A third hydrologic boundary may exist to the southeast due to the presence of a subsurface ridge of relatively impermeable rocks extending to the southwest from Bare Mountain (Winograd and Thordarson 1975). Therefore, the existing well is bounded on three sides, and possibly four sides, by bedrock characterized as an aquitard and by the extent of the saturated alluvium.

Figure 3-3: Potentiometric Map

Figure 3-4: Section A-A' Proposed Pit

A well drilled approximately two miles northwest and 800 feet lower in elevation than the Reward Project encountered water at 45 feet bgs within the basin fill aquifer. However, mineral exploration boreholes in the Project Area did not encounter the basin fill aquifer or any perched water tables to an elevation of 3,400 feet amsl.

Ground water development and use in the vicinity of Project Area are generally limited to the town of Beatty and surrounding areas and active mines. The major water users of record according to the Nevada State Engineer (1998) are Beatty Water and Sanitation District, Oasis Land, Beatty G.I.D., Stirling Mine, Rayrock (Glamis) Mines, the A. Revert Trust, BKK Company, and Barrick Bullfrog Enterprises. Most of the water appropriated in the Amargosa Desert Hydrographic Basin is used for mining and milling purposes, a substantial portion of the remaining appropriation is used for domestic, irrigation, and recreational purposes. According to the Nevada State Engineer, each of the three hydrographic basins in the vicinity of the Project; Oasis Valley, Crater Flat, and Amargosa Desert, is over appropriated. Most of the current water rights in the area are either certificated or permitted, and only one is vested.

Available water quality data within the vicinity of the proposed project indicate ground water in the area is generally potable. Ground water samples from the alluvial aquifer around Bare Mountain revealed that total dissolved solids (TDS) concentrations range from 222 to 1,080 mg/l. Similarly, available water quality data on the carbonate aquifer revealed that TDS concentrations ranged from 319 to 508 mg/l. Ground water samples taken from the Tertiary volcanics in Crater Flat and near Yucca Mountain indicated TDS concentrations ranged from 220 to 347 mg/l (McKinley et al. 1991).

3.7.3 Waters of the United States

There are no wetland or riparian areas within the Project Area (Roukey 1998). The nearest areas having wetland vegetation are Specie Spring, located approximately three miles northwest of the Project Area, and Amargosa Narrows, located approximately five miles northwest of the Project Area.

Jurisdictional determination surveys were conducted within the Project Area and along the water pipeline. Four ephemeral washes were determined to be jurisdictional waters of the United States; one located along the north end of the Project Area; a second wash located just north of the proposed Reward Pit and North Dump; another in the area of the proposed heap leach facility; and a fourth wash was found along the proposed water line route.

3.8 Vegetation

The Project Area is located within the northeastern portion of the Mojavian Floristic region. This region is characterized by moderate to high mountain ranges and intervening valleys which generally follow a north-south parallel pattern (Cronquist et al. 1972). The Mojave Desert is characterized by hot, dry summers and cool, dry winters (Thorn et al. 1981). Precipitation within the desert typically

occurs from either winter rains or summer thundershowers. In general, the vegetation of the Mojave Desert is dominated by low, widely-spaced shrubs, which develop in response to limited rainfall.

The Project Area includes an elevation range of approximately 2,900 feet to 4,600 feet. Topography varies from a gently sloping alluvial plain to steep rocky hills. Plant communities vary along elevation gradients due to differences in the amount of rainfall and varying soil types (MacMahon 1985). The communities vary from a predominately creosote bush community at the lower elevations to a mixed desert shrub community at higher elevations. Cacti are common in both plant communities.

The primary vegetation community within the Project Area is the creosote bush desert scrub type occupying the gently sloping alluvial fans and valleys (Figure 3-5). A mixed desert shrub vegetation type occupies the Project Area upper elevations. Small isolated areas of disturbed land occur within the Project Area, created by historical mining activities and modern day exploration practices. A list of plants observed within the Project Area during the vegetation survey is provided in Table 3-4. No noxious weeds were observed within the Project Area during the vegetation survey.

Table 3-4: Plant Species Observed within the Project Area

Common Name	**Scientific Name**
Beavertail cactus	*Opuntia basilaris*
White bursage	*Ambrosia dumosa*
Cottontop cactus	*Echinocactus polycephalus*
Creosote	*Larrea tridentata*
Desert trumpet	*Eriogonium inflatum*
Fluffgrass	*Erioneuron pulchellum*
Globe mallow	*Sphaeralcea ambigua*
Hedgehog cactus	*Echinocereus engelmannii*
Mormon tea	*Ephedra nevadensis*
Prince's plume	*Stanleya pinnata*
Russian thistle	*Salsola iberica*
Skeleton weed	*Eriogonim deflexum*
Spiny chorizanthe	*Chorizanthe ridida*
Desert larkspur	*Delphinium parshii*
Indigo bush	*Psorothamnum fremontii*
Mojave aster	*Xylorhiza tortifolia*
Mustard species	*Descurania sp.*

Common Name	Scientific Name
Plantain	*Plantago insularis*
Range ratany	*Krameria parvifolia*
Snakeweed	*Gutierrezia microcephala*
Spiny menodora	*Menodora spinescens*
Red brome	*Bromus madratensis var. rubens*
Shadscale	*Atriplex confertifolia*
Spiny hopsage	*Grayia spinosa*
Winterfat	*Ceratoides lanata*
Four-wing saltbrush	*Atriplex canescens*
Widow's locoweed	*Astragalus layneae*
Blackbrush	*Coleogyne ramosissima*
Brittlebrush	*Encelia farinosa*
Fiddleneck	*Amsinckia, sp.*
Indian paintbrush	*Castelleja, sp.*
Desert needlegrass	*Stipa speciosa*
Indian ricegrass	*Oryzopsis hymenoides*
Barrel cactus	*Ferocactus acanthodes*
Notch-leafed phacelia	*Phacelia crenulata*
Yellowcups	*Camissonia brevipes*
Desert marigold	*Baileya multiradiata*
Desert chickory	*Rafenesquia neomexicana*
Fleabane	*Erigeron divergens*
Fremont pincushion	*Chaenactis fremontii*
Filaree	*Erodium circutarium*
Cholla	*Opuntia sp.*

3.9 Wildlife

The creosote bush desert scrub and mixed desert shrub vegetation types provide habitat for a limited number of wildlife species which are uniquely adapted to the high temperatures, low precipitation, and specialized vegetation of the region. The Project Area was surveyed during 1998 to determine the wildlife resources present (Figure 3-5).

3.9.1 Mammals

A number of species of mammals are expected to occupy or use the Project Area on a year long or seasonal basis. A partial list of the more common species associated with the vegetation types of the area includes the following: coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), jackrabbit (*Lepus californicus*), cottontail rabbit (*Sylvilagus auduboni*), bobcat (*Felis rufus*), desert kangaroo rat (*Dipodonmys deserti*), white-footed mouse (*Peromyscus* spp.), and the whitetail antelope squirrel (*Ammospermophilus leucurus*). During the detailed survey, the following mammal species were observed at the project site: cottontail rabbit, jackrabbit, and whitetail antelope squirrel. Coyote scat and tracks were also observed within the Project Area.

No desert bighorn sheep (*Ovis canadensis*) or sign was observed within the Project Area or in immediately adjacent areas during the survey. Bighorn sheep occupy the nearby mountain ranges adjacent to the Project Area and have been observed during the Nevada Department of Wildlife (NDOW) annual bighorn sheep survey (Stevenson 1998). A guzzler for desert bighorn sheep is located at T 13 S, R 47 E, Section 1, over one-half mile east of the Project Area.

Figure 3-5: Wildlife and Botanical Species of Concern Survey

3.9.2 Birds

A variety of bird species are expected to inhabit or use the Project Area on a year long or seasonal basis. A partial list of the more common species associated with the vegetation types found in the area includes the following: red tailed hawk (*Buteo jamaicensis*), prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), greater roadrunner (*Geococcyx califonianus*), mourning dove (*Zenaida macroura*), common raven (C*orvus corax*), white-throated swift (*Aeronautes saxatalis*), western kingbird (*Tyrannus verticalus*), blackthroated sparrow (*Amphispiza bilineata*), and rock wren (*Salpinctes obsoletus*). A complete list of bird species observed on the proposed Project Area while conducting the wildlife surveys is found in Table 3-5.

Table 3-5: Bird Species Observed within the Project Area

Common Name	Scientific Name
WhiteThroated swift	*Aeronautes saxatalis*
Mourning dove	*Zenaida macroura*
Common raven	*Corvus corax*
Blackthroated sparrow	*Amphispiza bilineata*
Redtail hawk	*Buteo jamaicensis*
House finch	*Carpodacus mexicanus*
Prairie falcon	*Falco mexicanus*
Ash Throated flycatcher	*Myiarchus cinerascens*
Rock wren	*Salpinctes obsoletus*
Say's phoebe	*Sayornis saya*

3.9.3 Amphibians

Only limited opportunities exist in desert environments for habitation by amphibian species. Talus slopes, crevices, and moist soil conditions provide retreats for amphibians. Seeps and springs provide adequate and necessary breeding environments. The lack of permanent water resources in the Project Area makes it unlikely that amphibians would be present. No amphibians were found on the Project Area during the wildlife surveys.

3.9.4 Reptiles

Reptiles are a common component of the desert fauna. Typical reptile species that may be found include the following lizards: western whip-tail lizard (*Cnemidophorus tigris*), side-blotch lizard (*Uta stansburiana*), zebra-tailed (*Callisaurus draconoides*), horned lizard (*Phrynosoma platyrhinos*), leopard lizard (*Gambelia wislizenii*), and the desert spiny lizard (*Sceloporus magister*).

During the wildlife surveys, the western whip-tail lizard, side-blotched lizard, zebra-tailed lizard, desert-spiny lizard, and chuckwalla (*Sauromalus obesus*) were observed.

The following snake species may also be commonly found: gopher snake (*Pituophis melanoleucus*), speckled rattlesnake (*Crotalus mitchelli*), Mojave rattlesnake (*Crotalus scutulatus*), sidewinder (*Crotalus cerastes*), coachwhip (*Masticophis flagellus*), common kingsnake (*Lampropeltis getulus*), western blind snake (*Leptotyphlops humilis*), and the night snake (*Hypsiglena torquata*). During the detailed survey, the coachwhip and gopher snakes were observed.

3.10 Wild Horses and Burros

A portion of the Project, approximately 4,000 feet of the water line and the water well, is located in the Bull Frog Herd Management Area administered by the BLM Tonopah Resource Area. No wild horses or burros were observed in the Project Area, however, burros and wild horses have previously been inventoried in the area.

3.11 Special Status Species

3.11.1 Plants

Two sensitive plant species were identified by the Nevada Natural Heritage Program (NVNHP) as potentially present within the Project Area. The BLM identified six sensitive plants of concern, and the U.S. Fish and Wildlife Service (USFWS) identified two additional species of concern that may occur near the Project Area. The list of sensitive plants that could potentially occur within the Project Area is provided in Table 3-6.

Table 3-6: Sensitive Plant Species with Potential to Occur within the Project Area

Common Name	Scientific Name
Black woolypod or Funeral Mountain Milk Vetch	*Astragalus funereus*
Amargosa penstemon	*Penstemon fruticiformis ssp. amargosae*
Pahute Mesa beard tongue	*Penstemon pahutensis*
Ripley gilia	*Gilia ripleyi*
Delicate rockdaisy	*Perityle intricata*
Mojave sweetpea	*Lathyrus hitchcockianus*
Mojave fishook cactus	*Sclerocatus polyancistrus*
Clokey eggvetch	*Astragalus oopherous var. clokeyanus*
White bearpoppy	*Arctomecon merriamii*
Halfmoon milk vetch	*Astragalus mohavensis var. hemigyrus*

3.11.1.1 Funeral Mountain Milk Vetch

Habitat for the Funeral Mountain milk vetch usually consists of unstable, steep, gravelly slopes of volcanic tuff, or occasionally limestone scree slopes. The shadscale vegetation type within the Project Area contains plant species typically associated with Funeral Mountain milk vetch. However, no individuals of this species were observed within the Project Area.

3.11.1.2 Mojave Sweetpea

The Mojave sweetpea is known to occur east of Busch Peak, between Gold Bar and Bullfrog Mountain, and at four locations north of the general Project Area. Habitat for the Mojave sweetpea includes washes and canyon bottoms in rocky volcanic gravelly or sandy soil. This species was not observed within the Project Area.

3.11.1.3 Mojave Fishhook Cactus

The Mojave fishhook cactus is known to occur west of Rhyolite, north of Rainbow Mountain, at Ladd Mountain, and near the Montgomery-Shoshone area. The Mojave fishhook cactus is protected under the Nevada Cactus-Yucca law, which protects all succulent and cactus species in Nevada.

Mojave fishhook cactus generally occupies a variety of habitats including desert flats, mesas, rocky slopes, and knolls. Although several species of cacti were observed within the Project Area, the Mojave fishhook cactus was not found.

3.11.1.4 Ripley Gilia

Ripley gilia exists only in southern Nevada. It is found in the Bare Mountains, the Nevada Test Site at the Spector Range, and in the Spotted Range in Nye County. It occupies exposed crevices of limestone cliffs and is associated with creosote and saltbush. The general elevation range is 3,000 to 5,000 feet. Although habitat suitable for this species occurs within the Project Area, no individuals of this species were located.

3.11.1.5 Delicate Rockdaisy

The delicate rockdaisy species is rare and is known from the Pahrump Valley and Spector Range in Nye County. It occupies rock crevices, canyons, lower slopes, washes, and volcanic cliffs on limestone desert ranges. It is associated with saltbush, sagebrush, and piñon-juniper. It occurs at elevations ranging from 2,600 to 4,800 feet. No individuals of this species were observed on the Project Area.

3.11.1.6 Amargosa Penstemon

The Armagosa penstemon species is known to occur in Western Nevada and East San Bernardino County, California. It occupies dry, rocky places in sandy and gravelly washes and is associated with creosote bush scrub. General elevations range from 3,300 to 5,200 feet. No individuals of this species were observed on the Project Area.

3.11.1.7 Pahute Mesa Beard Tongue

Habitat for the Pahute Mesa beard tongue species is usually open areas of very loose soil and very rocky places among boulders and rock crevices. Elevations range from 5,800 to 7,500 feet in piñon-juniper woodlands or sagebrush shrublands. The Project Area elevation is somewhat below the known range for this species and no individuals of this species were observed within the Project Area.

3.11.1.8 White Bearpoppy

The White bearpoppy is known to occur in the Death Valley region of California to Clark County, in Nevada. Habitat for this species is loose rocky soils in the creosote bush scrub at elevations ranging from 3,000 to 4,500 feet. No individuals of this species were observed within the Project Area.

3.11.1.9 Clokey Egg Vetch

Habitat for the Clokey egg vetch occurs on barren hillsides and bare places in canyons in the elevation range of 6,800 to 9,100 feet in sagebrush scrub and piñon-juniper. The Project Area elevation is below the known range for this species and no individuals of this species were observed within the Project Area.

3.11.1.10 Half-Moon Milk Vetch

Habitat for the Half-moon milk vetch occurs on rocky slopes in canyons or on cliff ledges composed primarily of limestone. Elevations range from 4,100 to 6,100 feet. These plants are known to occur in the Spring Mountains in Nevada. No individuals of this species were observed within the Project Area.

In summary, during the vegetation survey conducted on the Project Area between May 15 and May 22, 1998, no sensitive plant species were observed. Another species of milk vetch, widow's locoweed (*Astragalus layneae*), was found on the northern edge of the Project Area on the process-related site area between the proposed open pit site and the north waste dump. Widow's locoweed is a common perennial on the north Bare Mountains, Yucca Mountain, Bullfrog Hills, and Tolicha Peak in Nye County. A variety of cactus species was identified within the Project boundaries. All

members of the Cactaceae family are protected by the State of Nevada (NRS 527.060 – 527.120). Cacti identified within the project boundaries included barrel cactus (*Ferocactus acanthodes*), beavertail cactus (*Opuntia basilarisI*), cottontop cactus (*Echinocactus polycephalus*), hedgehog cactus (*Echinocereus engelmannii*), and jumping cholla (*Opuntia* sp.).

3.11.2 Animals

A list of sensitive animal species that are potentially present within the Project Area was obtained from the Nevada Natural Heritage Program (NNHP), the BLM, and the United States Fish and Wildlife Service (USFWS). These species are listed in Table 3-7.

Table 3-7: Special Status Animal Species with Potential to Occur within the Project Area

Common Name	**Scientific Name**
Mojave desert tortoise	*Gopherus agassizii*
Gila monster	*Heloderma suspectum*
Chuckwalla	*Sauromalus obsesus*
Mountain plover	*Charadrius mountanus*
Western burrowing owl	*Athene cunicularia hypugea*
Amargosa toad	*Bufo nelsoni*
Spotted bat	*Euderma maculatum*
Greater western mastiff bat	*Eumops perotis californicus*
Allen's big-eared bat	*Idionycteris phyllotis*
California leaf-nosed bat	*Macrotus californicus*
Small-footed myotis	*Myotis ciliolabrum*
Long-eared myotis	*Myotis evotis*
Fringed myotis	*Myotis thysanodes*
Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*
Pacific Townsend's big-eared bat	*Plecotus townsendii townsendii*

3.11.2.1 Desert Tortoise

On April 2, 1990, the Mojave Desert populations of desert tortoise were listed as threatened by USFWS. This is the only threatened species known to occur in the vicinity of the Project Area. The designation of threatened indicates that the desert tortoise is likely to become endangered in the near future throughout all or a significant portion of its range. The tortoise is also listed as a rare and protected species by the Nevada Division of Wildlife (NDOW).

Neither desert tortoise nor tortoise sign was observed during the wildlife survey completed at the Project Area. The Project Area is located within desert tortoise habitat. The Project Area is covered by the *Programmatic Biologic Opinion for the Implementation of Multiple Use Activities within the Las Vegas Field Office* (File No. 1-5-97-F-251), and is located in *Area C* as designated in the above *Biological Opinion*. Area C habitat is considered lower quality tortoise habitat.

3.11.2.2 Gila Monster

The gila monster is considered by USFWS as a species of concern in Nevada, and by NDOW as rare and protected. The gila monster is a large, secretive, heavy-bodied, venomous lizard with short limbs, massive head, and a large, thick tail. Its coloration is orange/yellow and black. The gila monster inhabits desert washes, canyons, and riparian areas where it has access to water or moist soils. Due to its secretive nature, accurate and reliable population estimates and distribution data for southern Nevada do not exist. No gila monsters or indication of their presence was observed during the wildlife survey of the Project Area. However, based on gila monster habitat requirements and Project Area vegetation and topography, it is possible that this lizard occurs within the Project Area.

3.11.2.3 Chuckwalla

The chuckwalla is listed as a species of concern by USFWS, a sensitive species by BLM, and is classified as unprotected by NDOW. The chuckwalla is a large, rock-dwelling heavy-bodied, herbivorous lizard, and is generally nocturnal. It is widely distributed throughout southern Nevada and can be found on nearly every rocky hillside, large outcrop, and rock escarpment in desert habitat. They are not often seen in daylight hours, during which they are usually wedged within rocky crevices. Two chuckwallas were observed in the Project Area near the northern boundary of the proposed open pit.

3.11.2.4 Mountain Plover

The mountain plover is classified as a candidate species by USFWS and is protected by NDOW. The mountain plover inhabits semi-arid plains, grasslands, and plateaus. Mountain plovers do not inhabit the Project Area because of the absence of adequate breeding and wintering habitat. No mountain plovers were observed during the wildlife surveys.

3.11.2.5 Western Burrowing Owl

The western burrowing owl is classified as a species of concern by USFWS and is protected by NDOW. The western burrowing owl is a small owl, 9 to 11 inches in length, found in open country, and widely distributed throughout southern Nevada. The burrowing owl inhabits open grasslands, prairies, deserts, and farmlands, with nests in burrows in the ground. No burrowing owls were observed within the Project Area during the wildlife surveys.

3.11.2.6 Amargosa Toad

The Amargosa toad is considered by USFWS as a species of concern in Nevada, by BLM as a sensitive species, and by NDOW as rare and protected. The Amargosa toad is a chunky, short-legged, warty, tailless amphibian with parotoid glands similar to other western toads, but with a narrower head, long snout, and elbows and knees that do not touch when placed along its sides. This toad inhabits desert streams and springs and is found in the Amargosa River Valley near Beatty, Nye County, Nevada. Neither Amargosa toads nor their habitat was found during the wildlife survey conducted in the Project Area.

3.11.2.7 Bats

NDOW lists the spotted bat as protected and rare. All other bats presented in Table 3-10 are listed as unprotected by NDOW but listed as sensitive species by the BLM. No bats or myotis were observed during the biological survey conducted in the Project Area.

Potential bat roosting habitat within the Project Area is limited to two mine shafts (Figure 3-5) and the remains of mining at the Gold Ace Mine Complex and other mine-related habitation remains near the north end of the Project Area. One shaft, located in the area of the proposed heap leach facilities, is approximately 60 feet deep. The second shaft, located west of the proposed Southwest Dump, is shallow. The remnants of the historic Gold Ace mine, and an unidentified mine habitation, located between the proposed waste dumps on the east and the proposed Project haul roads on the north, west, and south, also represented limted, potential bat roosting habitat. These structures are in various stages of collapse and ruin, and represent temporary habitat. The shafts and structures were investigated for bat presence during the wildlife survey; neither bats nor bat sign were observed (Turner 1999).

Substantial cliff and canyon habitat with suitable rock crevices and cave openings exists immediately adjacent to the Project Area to the east and north. Because the adjacent cliff and canyon habitat to the east are not a part of the Project Area, they were not surveyed for bats.

3.12 Visual Resources

The BLM Las Vegas Field Office is separated into seven distinct areas in terms of scenic values. The Amargosa Valley area is found in the north west portion of the district between Pahrump and Beatty. Most of the landscape is characterized by flat bajada type desert country with creosote bush communities and some minor hills and mountains. The eastern portion of the area borders the Nevada Test Site and exhibits colorful and rugged mountain ranges that breakup the monotony of the valley floor.

Public lands are classified into Visual Resource Management (VRM) Classes based on visual resource quality and types of management activities appropriate for a given area. The Project Area is located in a VRM Class III area. The management objective of a Class III area is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The existing landscape is dominated by the Bare Mountains, a rugged, sparsely vegetated range of mountains. These mountains are characterized by the angular lines of the ridges and steep-sided canyons. A strong linear element is provided by the exposed geologic formations. The texture of the mountains is fine-grained due to the limited amount of vegetation. Colors of the mountains vary with the exposure to the sun, but are dominantly gray, with some reddish hues present in the lower foothills. The mountains give way abruptly to the alluvial valley.

The gently sloping valley floor is characterized by a creosote-cactus community. The large interspaces between plants and the variety of growth forms and plant heights contribute to the coarse-texture of the valley floor. Linear elements are also provided by the existing public access road to the area. The vegetation contributes green and yellow-green color to the landscape and the soil varies from gray to almost a pink hue.

3.13 Socioeconomics

The Project Area is located in southern Nye County, Nevada. The nearest population center to the project is the town of Beatty, located approximately 8 miles north of the site. The small community of Amargosa Valley is located approximately 20 air miles southeast of the Project Area. The following sections describe the socio-economic environment of the area.

3.13.1 Population

Table 3-8 presents annual population estimates for Beatty, Amargosa Valley, and Nye County for the years 1980, 1990, 1996, and 1997. Nye County annual population estimates are also included for the years 1998 and 1999.

Table 3-8: Population Data for Beatty, Amargosa Valley, and Nye County, Nevada

Location	1980	1990	1996	1997	1998	1999
Beatty	740	1,623	1,448	1,570		
Amargosa Valley	1,024	845	915	990		
Nye County	9,048	17,929	27,610	27,610	30,410	32,710

3.13.2 Employment

Employment in Nye County, Nevada, is heavily dependent upon the mining industry, but also centers around gaming, recreation, and the trade businesses (State of Nevada 1994). Table 3-9 presents annual average unemployment rates for Nye County and the State of Nevada.

Table 3-9: Unemployment Rates for Nye County and the State of Nevada

Location	1980-1990	1995	1998
Nye County	5.6%	4.6%	4.2%
Nevada	7.1%	5.4%	4.7%

3.13.3 Housing

GGI's Glamis Daisy Mine contract employees would likely reside in either Beatty or Amargosa Valley. It is likely that employees could also reside in Pahrump. Currently in Beatty there are the following:

- 111 single-family detached housing units;
- 18 single-family attached housing units;
- 552 mobile home residences;
- 60 multifamily housing units;
- 6 campground and RV facilities; and
- 5 hotels/motels (222 rooms).

In Amargosa Valley there are a total of 460 housing units.

3.13.4 Schools

The community of Beatty has an elementary school, a junior high school, and a high school. Amargosa Valley has one school, the Amargosa Elementary School, serving grades kindergarten through eighth. All schools within Amargosa and Beatty are in Nye County School District. School enrollment and capacity figures are presented in Table 3-10.

3.13.5 Health Care Services

Health care services in Beatty are provided by the Nevada Rural Health Centers and supplied by the Beatty Medical Clinic which provides emergency care facilities and a flight-for-life to the Las Vegas Valley Hospital. The clinic is staffed with one physician, one physician assistant, and one medical assistant. Medical personnel are on call 24 hours a day, even though they are not guaranteed available. A volunteer Emergency Medical Technician (EMT) service is also available in Beatty. The EMT service has two ambulances.

Services in Amargosa Valley include one medical clinic, one physician's assistant, one visiting physician, and a volunteer ambulance service.

Table 3-10: School Enrollment and Capacity for Beatty and Amargosa Valley Schools, Nye County, Nevada

School	Enrollment as of Spring 1998	Capacity
Beatty Elementary/Middle School	259	320
Beatty High School	154	250
Amargosa Elementary School	187	n/a

3.13.6 Law Enforcement

Law enforcement in Beatty is provided by the Beatty substation of the Nye County Sheriff's Department and the Nevada Highway Patrol. Staff at the Beatty station includes one captain, one sergeant, three deputies, five dispatchers, and three Highway Patrol officers. The dispatchers service the EMT service, the fire department, and the sheriff's department. A dispatcher is on duty 24 hours a day.

Law enforcement in Amargosa is provided by the Amargosa Valley substation of the Nye County Sheriff's Department. Staff includes two deputies and four dispatchers.

3.13.7 Fire Protection

Fire protection in Beatty is provided by the Beatty Volunteer Fire Department which is part of the Nye County Fire Department. Fire protection extends to an approximately twenty-mile radius in all directions around Beatty. The department has one pumper, one 4,400 gallon capacity tanker, one 1958 International reserve truck, and one fully-equipped rescue vehicle.

In Amargosa Valley, the fire protection is provided by a volunteer two station fire department.

3.13.8 Water and Sewer

The Beatty Water and Sanitation District provides the water and sewer services to the community of Beatty. Barrick, operator of the Bullfrog Mine, donated a well to the town of Beatty, and a new pipeline has been installed to transport water from this well to Beatty.

Water in Amargosa Valley is provided by private wells. According to the Nevada Division of Water Resources, water rights within the Amargosa Valley are over-appropriated. However, by Nevada Law, single family domestic uses are guaranteed water rights (Robert Martinez 1998).

3.13.9 Electrical Services

Valley Electrical Association provides the electrical services to the Beatty and Amargosa Valley communities.

4 ENVIRONMENTAL CONSEQUENCES, MITIGATION AND CUMULATIVE IMPACTS

4.1 Environmental Consequences - Proposed Action

4.1.1 Access and Rights-of-Way

No rights-of-way would be impacted by the implementation of the Proposed Action. Public access to the canyon north of the Project and to Carrara Canyon would remain via the existing public access roads. The unnamed canyon due east of the Project would have restricted access during the life-of-mine due to public safety issues.

Impacts to the current land uses of mineral exploration and dispersed recreation would be slight. GGI has proposed fencing, as necessary, for public safety and to prevent burros from entering the active mine area. Maintenance of public access to the unnamed canyon north of the mine site and to Carrara Canyon would allow dispersed recreation to continue in areas adjacent to the Project Area.

4.1.2 Soils

Direct impacts to soils would result from the construction of the proposed open pit and other facilities. Total disturbance to soil resources from the Proposed Action would be approximately 214 acres. The displacement of soil would occur as proposed facilities are developed. As soils are collected, stored, and redistributed, they would become mixed. This may result in changes in soil texture and permeability. In addition, changes in soil depth (difference from the original undisturbed soil depth) would occur. About 50 percent of Soil Unit 2301 in the area of the North and Southwest waste rock dumps and open pit would not be salvaged due to restricted access on slopes in these areas.

4.1.3 Geologic Resources

Geologic and mineral resources within the Project Area would be directly impacted by the relocation of approximately 2.8 million tons of processed ore and 5.1 million tons of waste rock. In addition, approximately 77,560 ounces of gold would be extracted from the gold bearing ore.

The Project is located in a low precipitation/high evaporation area. Therefore, drainage from infiltrating meteoric water through the waste rock dumps is not projected to occur. No groundwater or springs have been identified during reconnaissance and condemnation drilling in the entire Project Area. In addition, the waste material to be mined from the Reward open pit demonstrates excess acid neutralizing potential, and MWMP tests indicated that secondary drinking water standards were only exceeded in basic range pH levels (pH values 8.86-9.05).

Waste rock dumps and mine pit walls were designed in accordance with the NDEP specifications for the regional climate cycles, storm conditions, and seismic activity. No impacts from seismic activity to the Project facilities are anticipated.

No scientifically significant paleontological resources have been identified in the immediate area of the Project; however, fossils have been identified in the nearby Bare Mountain Range. There is a potential for direct impacts to previously unidentified scientifically significant paleontological resources during mining operations, specifically from the development of the open pit. Although these fossils would have otherwise remained unavailable for examination, it is possible that some fossils could be destroyed during the mining operations. Indirect impacts to paleontology are unlikely. Residual impacts would occur should paleontological resources be destroyed.

4.1.4 Air Quality

Direct impacts to air quality as a result of the Proposed Action would be localized and short term for the operational life of the Project, approximately three years, and after mine closure during the period of time required for vegetation establishment, which is estimated to be three to five years. The potential impacts to air quality would result primarily from particulate emissions PM_{10} from the mining and ore processing operations. Truck hauling of ore and waste, and wind erosion are the primary emission sources. Crushing emissions from ore processing would comply with Federal New Source Performance Standards for the metallic mineral processing industry. There would be minor levels of particulate matter emitted during regrading and reclamation efforts as well as from disturbed areas until vegetation is established. These activities would occur in localized areas of the mine. Ambient concentrations of PM_{10} are well below the 24-hour and annual PM_{10} National and State of Nevada Air Quality Standards provided in the Nevada Administrative Code (NAC 445B.391). The particulate emissions generated by the operation of the proposed Project should not impact the overall area air quality.

Low levels of gaseous emissions would be associated with the operation of the construction and mining equipment. The above-ground fuel storage tanks (diesel and gasoline) would also produce some hydrocarbon emissions, but due to the relatively small tank size and minimal throughput, it is expected that these emissions would be very minor. Ambient concentrations of these gaseous air pollutants in the area are expected to be near background levels and well below National Ambient Air Quality Standards (NAAQS). Thus, the addition of gaseous emissions from the sources listed above should not impact the air quality.

4.1.5 Cultural Resources

No sites recommended as eligible for inclusion in the National Register of Historic Places were located during cultural inventories of the Project Area. Therefore, the Proposed Action would not have any direct or indirect adverse impact on any cultural resources.

4.1.6 Native American Religious Concerns

Native American Consultations are not automatically conducted for every action. Pursuant to completion of an existing data review, BLM considers the quantity of ethnographic information available, the probability of Native American traditional use areas, and the degree to which the undertaking has the potential to adversely affect those resources. The field inventory did not identify any significant prehistoric sites which would trigger the agency to expand its consultation efforts with Native Americans. There was no ethnographic information of potential traditional cultural properties found. The evaluation of the cultural resources was conducted in consultation with the State Historic Preservation Officer (SHPO). The SHPO concurred with the BLM determination of no adverse effect for the undertaking.

4.1.7 Water Resources

4.1.7.1 Surface Water

No perennial surface water resources exist within the immediate vicinity of the Project Area. Amargosa Narrows and Specie Spring, located approximately five miles northwest and three miles northeast of the Project Area, respectively, are the nearest surface water resources. The springs in Amargosa Narrows lay upgradient from the Project Area, while Specie Spring is topographically isolated from the Project Area by the Bare Mountains. Therefore, it is not possible for stormwater run-off from the Project to impact these spring areas.

Although unlikely, stormwater run-off from the mine site could reach the Amargosa River. Impacts to the Amargosa River are not anticipated because surface flow at the mine site would be controlled and channeled to prohibit surface run-off from leaving the property. Diversion and sedimentation structures, as needed, would be designed to handle the 100-year, 24-hour storm event.

Residual impacts to permanent surface water resulting from the Proposed Action are unlikely due to the distance and topographic isolation of the existing springs. Reclamation that would be performed following mine closure would further reduce any potential for impact. Diversion ditches and detention basins would be revegetated as part of reclamation. These ditches would remain as a post-mining land feature to control surface flow which may result from storm events.

4.1.7.2 Ground Water

Subsurface drilling within the Project Area has not encountered the ground water of the carbonate or the basin fill aquifers. No perched water has been encountered on site. Based on the data presented in section 3.7.2 of this EA, the development of the Reward Pit would not intercept the ground water of any known aquifer.

The waste rock dumps would be located approximately 1,200 feet above the ground water table. Waste rock characterization does not indicate a potential for the leaching of contaminants from the waste rock. Therefore, no degradation of the ground water is anticipated from the construction or location of the waste rock dumps.

The ground water table is estimated to be in excess of 1,200 feet bgs. The potential for impact to the ground water from run-off is low due to low the annual precipitation rate, the natural attenuation of the alluvial material, and the high evapotranspiration rate for the site.

The proposed water supply well was established for the Bullfrog Project and impacts of this well and three other wells were analyzed in the Bullfrog Project EA (BLM 1988). The withdrawal of approximately 2,000 gps over the 10-year life of project was predicted to create a maximum drawdown of 90 feet at the center of the well field. The radius of influence (i.e., five feet of drawdown) extended out approximately four miles to the southwest and northeast. Water level recovery to pre-mine levels was expected within 10 to 50 years. The proposed use of one well at the rate of 125 to 175 gps, or less than one-tenth of the previous withdrawal, would extend the impacts over the life of the Reward Project, by slowing the recovery rate to the pre-mine water levels. Therefore, the nature of the impact due to the Proposed Action would be similar to the existing condition, but the level of impact would be less. No other operating water wells currently exist within this hydrologic boundary; therefore no impacts to individual water supplies are anticipated by the use of the existing well.

Current water rights on file with the Nevada State Engineer indicate there are no water users in the immediate area of the proposed Project, although there are several on the north side of the Bare Mountains. Historic pumping from MW-4, located in northern Crater Flat, has not resulted in impacts to the Amargosa River, and recent monitoring of well MW-3 has not indicated changes in ground water depths. The use of an existing water supply well would not represent a new impact, but the continuation of an existing, approved use.

4.1.7.3 Waters of the United States

Approximately 0.879 acres of jurisdictional ephemeral washes would be filled by the Proposed Action and include the following: Approximately 0.176 acres of a wash at the north end of the access road to the Good Hope portion of the Reward Pit; 0.551 acres of a wash in the southern portion of the Project; and 0.152 acres along the route of the proposed waterline. The ephemeral wash at the north end of the project area would not be impacted by the Proposed Action. The flows in these washes do not normally reach the Amargosa River, but instead infiltrate into the alluvial terraces. The Proposed Action would not prevent the infiltration of the flow into the alluvial basin, but would block the flow of the jurisdictional washes to the Amargosa River.

4.1.8 Vegetation

The direct impact to vegetation would be the disturbance of 214 acres of creosote bush desert scrub and mixed desert shrub vegetation within the Project Area. State-protected cacti are located throughout the Project Area. It is unlawful to cut, destroy, mutilate, remove, or possess any cactus from any of the lands owned by or under the jurisdiction of the State of Nevada or its counties (NRS 527.100). The environmental protection measures included in the Proposed Action provide for all cacti in the area of proposed disturbance to be removed and transplanted prior to surface disturbance. Upon completion of the earthwork and seeding portions of the reclamation plan, these cacti would be transplanted to suitable reclaimed surfaces. It is likely that some mortality of cacti would occur during these transplanting activities. However, with proper precautions, the impact can be kept minimal. Mitigation for impacts to the plants is detailed in Section 4.4.3.

Disturbance would occur over the life of the mine. As facilities are constructed, concurrent reclamation would be initiated as practicable. Upon cessation of mining activities, growth media would be redistributed over disturbed areas, followed by seeding with an approved seed mix. Plant species used in the seed mix may result in a slightly different vegetation community until natural volunteer seeding of the area by species from surrounding, undisturbed area could become established. Due to the poor condition of the soils in the Project Area for reclamation (section 3.2) revegetation may not be successful. Mitigation for this impact is provided in section 4.4.3.

4.1.9 Wildlife

Project construction activities would result in the destruction of surface soil properties, existing vegetation, natural topography, and the displacement of the majority of wildlife species inhabiting the Project Area. Most wildlife species have the capability of evacuating the Project Area when mining processes are initiated. Mortality among species of reptiles and rodents is expected during initial mine grading activities on the Project Area.

4.1.9.1 Mammals

Some mortality of small mammals, such as kangaroo rats, pocket mice, and antelope ground squirrels, would occur during mining activities on the Project Area. Large mammal species such as jackrabbits, coyotes, and kit foxes, would likely evacuate the Project Area when mining activities begin. It is unlikely that larger mammals would be physically harmed during construction unless occupied burrows are crushed.

The desert bighorn sheep guzzler is located approximately one-half mile from the Project Area and would not be impacted by the Proposed Action. The restricted public access to this area during the life-of-mine may offset any potential impacts caused by the mining activity. Although desert bighorn sheep have been observed on the Project Area in the past, no sign was observed during the

environmental baseline surveys. Pit design and proposed reclamation procedures would allow for safe ingress and egress of bighorn sheep at the conclusion of the Project.

4.1.9.2 Birds

The majority of birds occupying or using the Project Area would disperse once mining activities begin and habitat is removed. It is likely that minimal bird mortality would occur during late winter and early spring months prior to bird nesting. Habitat for these species would be lost until reclamation activities are completed and the sites are revegetated.

4.1.9.3 Amphibians

As discussed in Chapter 3, neither amphibians nor amphibian habitat was observed during the site wildlife survey. Project mining operations are expected to have no impact on amphibians.

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4.1.9.4 Reptiles

Impacts to lizards and snakes would depend on the time of year during which mining activities are initiated. Under warm weather conditions, reptiles are active and able to flee areas of mining activities. The most serious impact to reptiles would be due to the temporary loss of habitat and the destruction of shelters and burrows. The open pit area would represent a permanent loss of habitat.

4.1.10 Wild Horses and Burros

As discussed in Chapter 3, no wild horses or burros were observed in the Project Area, therefore, there would be no impacts to wild horses and burros in the project area. However, a total of 5.16 acres of disturbance would occur from the construction of the waterline through the Herd Management Area. This disturbance would occur on an existing road and not impact wild horses and burros.

4.1.11 Special Status Species

4.1.11.1 Plants

No special status plant species were observed on the Project Area during the 1998 survey. Therefore, no impacts to any special status plant species are anticipated due to the implementation of the Proposed Action.

4.1.11.2 Animals

4.1.11.2.1 Desert Tortoise

Tortoises have not been observed within the Project Area. However, approximately 214 acres of potential Desert Tortoise habitat would be impacted due to surface disturbing activities. Mitigation measures as discussed in Section 4.4.4 would minimize impacts resulting from Project construction and operations. Although no tortoises were found during the wildlife surveys of the Project site, there is a potential for incidental take of desert tortoises which might wander onto the Project site or access road from adjacent habitat.

4.1.11.2.2 Gila Monster

Gila Monsters have not been observed within the Project Area. However, approximately 214 acres of potential Gila Monster habitat would be impacted due to surface disturbing activities. Mitigation measures as discussed in Section 4.4.4 would minimize impacts resulting from Project construction and operations.

4.1.11.2.3 Chuckwalla

Chuckwallas, which are active during the spring, summer, and early fall months, inhabit rock outcrops, rocky talus slopes, and boulder piles. Throughout the year the chuckwalla seeks shelter and protection in cracks, crevices, and under rocks in its occupied habitat. Mining operations would have minimal adverse impacts to this species; appropriate mitigation measures implemented during the mine construction phase would minimize adverse impacts.

4.1.11.2.4 Mountain Plover

No impacts from the Proposed Action would occur to this bird. Neither these birds nor their required habitat is found on the Project Area.

4.1.11.2.5 Western Burrowing Owl

Neither burrowing owls nor their burrows were found on the Project Area. It is unlikely that any adverse impacts would occur to this species because of the proposed Project.

4.1.11.2.6 Amargosa Toad

Neither Amargosa toad nor toad habitat was found on the Project Area. The proposed Project would have no impact on this species.

4.1.11.2.7 Bats

No bats or bat sign were found in the Project Area. The shaft and structures near the Southwest Waste Rock Dump would not be directly impacted by implementation of the Proposed Action. The shallow shaft near the Gold Ace mine was a smooth-walled, short, and straight feature, not suitable for maternity colonies or as hibernacula (Cole 1999). Although the shaft and the nearby structures may be suitable for occasional night roosting, no guano or bats were observed at either site. The second shaft in the area of the proposed ore processing facilities would be backfilled during the construction of the Heap Leach Pad. No sign of bat roosting was observed in this shaft. Extensive night roosting habitat exists in the Bare Mountains adjacent to the Project Area; therefore the loss of this shaft is not likely to have an impact at the population level. The impacts to bats as a result of implementing the Proposed Action are expected to be minimal.

4.1.12 Visual Resources

Although located approximately three miles east of US Highway 95, the Project Area would be partially viewable by travelers on the highway. Three Key Observation Points (KOPs) were established to evaluate the impact to visual resources and are shown on Figure 4-1. The KOPs correspond to views along US Highway 95 from the northwest, southwest, and south. Figures, 3-8 and 3-9 include color photographs and computer generated images of the Proposed Action from KOPs 1, 2, and 3.

The view from the south, KOP #1, (Figure 4-2) would provide the greatest view of the open pit (Bullmoose North and South), some view of the Southwest and Southeast Dumps, heap leach, and the ancillary facility site area. During active mining, these facilities would create a moderate contrast in color due to the exposure of unweathered rock in the highwall and waste dump. A slight contrast in texture would result as these facilities would be isolated features on the landscape. The north area access road would add a linear element, but the vegetation and slight topographic features would make the road difficult to see from the highway. The benches of the waste dump would also add a strong linear element and contrast with the form of the background mountains. Any structures, storage tanks, or other facilities associated with the ancillary site area would also be viewable. These temporary facilities would likely have high contrast in line, form, color, and texture with the background landscape.

The view from the southwest, KOP #2, (Figure 4-3) would provide greatest view of the heap leach pads, but the foothills would block the view of most of the pit area (Bullmoose North and South). As the Southwest Dump is constructed, it would block more of the view of the pit area. The site area for the ancillary facilities would also be viewable from this KOP. The impacts from this viewpoint would be similar to those described above for KOP #1, except the degree of contrast in line and form due to the high visibility of the haul road would be greater.

The view from the northwest, KOP #3, (Figure 4-4) would include parts of the open pit highwall (Good Hope and upper Bullmoose North), the North Dump, ancillary site area, and portions of the north access road. The impacts from this viewpoint would be similar to those described above for KOP #1.

Landscape modifications resulting from the construction and operation of the Proposed Action would be within the BLM VRM Class III objectives. The Proposed Action is located on VRM Class III lands, where changes to the area would partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The contrasts in line, form, texture, and color created by the Proposed Action would be temporary in nature. The successful reclamation of the waste dump and haul road, as well as the removal of the ancillary facilities, would reduce or eliminate the contrasts in line, form, color, and texture. The exposed rock in the highwall would require years to decades to weather and change color, but due to the variety of rock color and visible lithographic layering, this contrast in color would not attract the attention of the casual observer. The effects of the Proposed Action on visual resources would be consistent with the BLM-prescribed Class III VRM objectives.

4.1.13 Socioeconomics

The work force for development of the Proposed Action would be primarily mine workers who are currently employed at the GGI Glamis Daisy Mine. No new work force is anticipated at the Project; therefore, no changes in population, employment, housing demand, school enrollment, demand for health care services, law enforcement needs, fire protection, demand for water and sewer, or electrical services should occur as a result of the implementation of the Proposed Action. The Project would extend the time period over which the existing impacts occur, but not create any new impacts.

The impacts to socioeconomic conditions by these employees were analyzed in the Daisy Project Environmental Assessment (BLM 1996; pages 4-21 through 4-25). It was estimated that because of the work force at the Glamis Daisy Mine and the need for GGI's supplies, equipment, and services from local venders would result in 30 indirect jobs in the rural sector and 20 jobs in the urban sector. It is anticipated that these indirect jobs would continue during the life of the Project.

The continued employment of the work force currently active at the GGI Glamis Daisy Mine, and the continued employment of those workers in the indirect jobs created by the GGI's operations results in a beneficial impact from the Proposed Action.

Figure 4-1: Key Observation Points

Figure 4-2: View From Key Observation Point 1

Figure 4-3: View From Key Observation Point 2

Figure 4-4: View From Key Observation Point 3

4.2 Environmental Consequences - No Action Alternative

Under the No Action Alternative, the Project would not be developed and the environmental impacts identified above for the Proposed Action would not occur. Implementation of the No Action Alternative would have an impact on the socioeconomic resources. Under the No Action Alternative, the approximately 48 jobs planned for continuation would not be extended. Without production from the Project, the facilities at the Glamis Daisy Mine would be closed and the associated jobs eliminated. In addition, the indirect jobs in the rural and urban sectors would decline.

4.3 Monitoring

The BLM is required to conduct quarterly field inspections of the Project as part of BLM compliance monitoring. In addition, the BLM would monitor adherence to specified mitigation measures and other stipulations outlined in the signed Decision Record. This compliance monitoring would continue for the period of the proposed mine construction, operation, and reclamation. A record of the field compliance inspections would be made and documented in the project case file at the BLM Las Vegas Field Office.

4.4 Mitigation

Direct and indirect impacts were identified for the following resources: lands, soils, geologic, air, vegetation, wildlife, special status species, and visual resources. No mitigation measures have been proposed, beyond the environmental protection measures of the Proposed Action, for lands, soils, air, water, wildlife, and visual resources. Mitigation for the impacts to other resources is detailed below.

4.4.1 Geologic Resources

In the event that scientifically significant, previously undiscovered, fossil resources were encountered during the development and operation of the Project, work shall be suspended in the immediate area of discovery and the BLM shall be notified. Work shall not resume prior to notification from the Authorized Officer.

4.4.2 Cultural Resources

In the event that any archaeological materials are discovered during the development of the Project that could be adversely affected by project-related actions, all activities in the immediate area of the cultural resource shall cease and GGI shall notify the BLM as soon as possible. Work shall not resume prior to notification from the Authorized Officer.

4.4.3 Vegetation

Seeds shall be collected from a local ecotype and used in revegetation activities. If it is not possible to collect an adequate quantity of seeds from the immediate vicinity (due to drought conditions), then local seed sources shall be used. The ratio of each species in the seed mixture shall be based on the natural species ratios.

Before surface disturbance, all cactus species within the Project Area shall be marked with plastic flagging and excavated. These plants shall be taken from the proposed areas of surface disturbance, heeled-in near the site, and transplanted back after mining activities have been completed. Upon completion of the proposed Project, some portions of the Project Area would no longer be suitable for transplantation of these plants. Cacti taken from these portions shall be transplanted to other areas of disturbance created by the Project. A maximum density for healthy growth of these plants shall be determined before their transplantation, and shall not be exceeded. Extra cacti shall be used for commercial harvest through consultation with BLM, USFWS, and the State Division of Forestry. All construction traffic shall be restricted to designated areas to reduce disturbance to adjacent land.

4.4.4 Special Status Species

4.4.4.1 Desert Tortoise

Implementation of the Proposed Action shall disturb 214 acres of potential desert tortoise habitat within Area C as designated in the Biological Opinion (File No. 1-5-97-F-251). To avoid or mitigate adverse habitat affects to the desert tortoise because of the proposed Project, GGI shall adhere to the following Terms and Conditions of Biological Opinion in Area C (File No. 1-5-97-F-251):

In order to be exempt from the prohibitions of Section 9 of the Endangered Species Act (Act), the applicant shall comply with the following terms and conditions, which implement the reasonable and prudent measures described below. These terms and conditions are nondiscretionary.

1) Measures shall be taken to minimize take of desert tortoise due to project-related activities.

    a) BLM, or their designee, shall provide a fact sheet to all foremen, workers, and other employees working on the project. The fact sheet would include information on the life history of the desert tortoise, legal protection for desert tortoises, penalties for violations of Federal and State laws, general tortoise activity patterns, reporting requirements, measures to protect tortoises, terms and conditions of the biological opinion, and personal measures employees can take to promote the conservation of desert tortoises. The definition of “take” would also be explained. Workers are encouraged to carpool to and from the Project site. The fact sheet shall be approved by BLM before implementation.

    b) A speed limit of 25 miles per hour shall be required for all vehicles on unposted dirt access

roads and on haul roads within the area identified as desert tortoise habitat. The speed limit on the roads outside of the known tortoise habitat, shall be 35 miles per hour.

c) During construction activities, tortoise burrows should be avoided whenever possible. If a tortoise is found on-site during mining activities which may result in take of the tortoise (e.g., in harms way), such activities shall cease until the tortoise moves, or is moved, out of harms way. The tortoise shall be moved by either a qualified tortoise biologist or individual trained in the proper technique of handling and moving desert tortoises. All workers would also be instructed to check underneath all vehicles before moving such vehicles. *Tortoises often take cover under vehicles.*

d) The search for, and removal of, tortoises (i.e., clearance) is voluntary, except for in areas where tortoise proof fencing is constructed as discussed in f. below. Applicants or project proponents may voluntarily choose to search for and remove tortoises from lands to be disturbed within the Project Area. However, applicants/project proponents that voluntarily choose to clear Project Areas of desert tortoises, shall follow measures required in terms and conditions of the biological opinion. Specific and detailed instructions would be provided on the proper techniques to capture and move tortoises which appear on site, in accordance with Service-approved protocol. Currently, the Service-approved protocol is Desert Tortoise Council 1994, revised 1996.

e) All ponds, including both fresh water ponds and solution ponds shall require fencing with tortoise proof-fencing. Fencing would consist of 1-inch horizontal by 2-inch vertical mesh (could change based on discussions with NDOW). A smaller mesh size would be acceptable. The mesh would extend at leach 20 inches above ground, and where feasible, 6 inches below ground. In situations where it is not feasible to bury the fence, the lower 6 inches of the fence shall be bent at a 90-degree angle towards the potential direction of encounter with tortoise and covered with cobble or other suitable material to ensure that tortoise or other animals can not dig underneath, thus creating gaps through which tortoises may traverse. The height of tortoise-proof fencing would be a minimum of 20 inches above ground. The fence shall be inspected, and zero clearance maintained between the bottom of the fence and the ground.

f) After the completion of the fence, all desert tortoises shall be removed from within the fences. If habitat remains within the fence, a qualified biologist shall oversee the survey for and removal of tortoise using techniques providing 100-percent coverage of all areas. Two complete passes of 100-percent coverage would be accomplished. All desert tortoise burrows, and other species burrows which may be used by tortoises, would be examined to determine occupancy of each burrow by desert tortoise. Tortoise burrows shall be cleared of tortoise and eggs, and collapsed. Any desert tortoises or eggs found in the fenced area would be removed under the supervision of a qualified tortoise biologist in accordance with Service protocol.

After a project has been fenced and a tortoise clearance completed, if the operator encounters a desert tortoise in imminent danger, the operator shall move the tortoise out of harm's way and onto BLM land. If the tortoise can not be avoided or moved out of harm's way onto BLM land, it shall be placed in a cardboard box or other suitable container and held in a shaded area until BLM personnel can retrieve the tortoise.

2) Measures shall be taken to minimize predation on tortoises by ravens drawn to the Project Area. A litter-control program shall be implemented, by the applicant, to minimize predation on tortoises by ravens drawn to the project site. This program would include the use of covered, raven-proof trash receptacles, removal of trash from the construction site to the trash receptacles following the close of each work day, and proper disposal of trash in a designated solid waste disposal facility. Vehicles hauling trash to the landfill and leaving the landfill must be secured to prevent litter from blowing out along the road.

3) Measures shall be taken to minimize destruction of desert tortoise habitat, such as soil compaction, erosion, or crushed vegetation, due to project-related activities.

   a) Overnight parking and storage of equipment and materials, including stockpiling shall be within previously disturbed areas or areas to be disturbed.

   b) All vehicle traffic would be restricted to existing access roads.

   c) Project activity areas would be clearly marked or flagged at the outer boundaries before the onset of construction. All activities shall be confined to designated areas. Blading of vegetation would occur only to the extent necessary and shall be limited to areas designated for that purpose by BLM.

   d) Prior to issuance of the permit, and prior to any surface-disturbing activity associated with the proposed project, the project proponent shall pay a remuneration fee of $587.00 for each acre of surface disturbance. For phased projects, fees would be paid prior to surface disturbance associated with each phase. This rate would be indexed for inflation based on the Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (CPI-U) on January 31 of each year, beginning January 31, 1998.

   The total fee for this project is $ $112,618.00 ($587.00 x 214 acres). This fee would be paid directly to the Desert Tortoise Public Lands Conservation Fund (Account Number 730-9999-2315), administered by Clark County or any other administrator approved by BLM and USFWS. The administrator serves as the banker of these funds and receives no benefit from administering these funds. These funds are independent of any other fees collected by Clark County for desert tortoise conservation planning.

   The payment shall be accompanied by the **Section 7 Fee Payment Form**, and completed

by the payee. The project proponent or applicant may receive credit for payment of such fees and deduct such costs from desert tortoise impact fees charged by local government entities. Payment shall be by certified check or money order payable to Clark County (or other administrator named by BLM and USFWS), and delivered to:

Clark County
Department of Comprehensive Planning
500 South Grand Central Parkway, Third Floor
Las Vegas, Nevada 89155-1712
Attn: Christina Gibson

In addition, a copy of the Section 7 Fee Payment form would be accompanied with a payment verification and delivered to:

The Bureau of Land Management
Las Vegas Field Office
4765 West Vegas Drive
Las Vegas, Nevada 89108
Attn: Assistant District Manager, Non-Renewable Resources

4) Measures shall be taken to ensure compliance with the reasonable and prudent measures, terms and conditions, reporting requirements, and reinitiation requirements contained in the biological opinion.

a) The project applicant shall notify BLM at least 10 days before initiation of the project. Notification shall be made to BLM's wildlife staff at (702) 647-5000.

b) The BLM wildlife staff (702/647-5000) and USFWS (702/646-3499) must be notified of any desert tortoise death or injury due to the project implementation by close of business on the following workday.

c) All appropriate NDOW permits or letters of authorization shall be acquired before handling desert tortoises and their parts, prior to initiation of any activity which may require handling tortoises.

d) The project proponent must submit a document to BLM within 30 days of completion of the project showing the number of acres disturbed, remuneration fees paid, and number of tortoises taken, which includes capture and displacement, killed, injured, and harassed by other means, during implementation of programmatic actions.

e) For tortoise removals outside of Clark County, initial notification shall be made to BLM as stated in Term and Condition 4.b. above.

4.4.4.2 Gila Monster

If gila monsters are encountered in the area of affect, contact Mr. Brad Hardenbrook as soon as possible at (702) 486-5127 (extension 3281) for instructions.

4.4.4.3 Chuckwalla

If the Project proponent desires, chuckwallas encountered in the Project Area may be captured and moved to adjacent rock outcrops where disturbance would not occur. Mr. Brad Hardenbrook should be contacted at (702) 486-5127 (extension 3281) for instructions.

4.5 Cumulative Effects

A cumulative effects analysis was conducted in the Daisy Project EA (BLM 1996, pages 5-1 through 5-13) and is incorporated by reference into this document. This Environmental Assessment is available for review at the Tonopah Field Office of the BLM, Tonopah, Nevada and the Las Vegas Field Office of the BLM, Las Vegas, Nevada. The cumulative effects area was identified as the area within a ten-mile radius of the Glamis Daisy Gold Mine.

The cumulative effects analysis in the Daisy Project EA included mineral exploration, pit development, heap leach pad and facility expansion, miscellaneous mine facilities (e.g., roads), and administrative uses as reasonably foreseeable future actions. The total disturbance analyzed for the reasonably foreseeable actions was 562 acres. The activities proposed for the Project and additional reasonably foreseeable future actions are within the scope and acreage analyzed in the Daisy Project EA; therefore, no additional analysis is required.

A summary of the reasonably foreseeable future actions and of the resources for which cumulative impacts were identified are included herein for clarity and reference.

4.5.1 Past Actions

Past disturbance includes the historic mining in the Bare Mountain Mining District, commencing with the discovery of gold in 1905. In addition to gold, the area has also produced mercury, kaolin (clay), fluorite, silver, and gem-quality opals. Disturbance associated with the historic mining is generally limited to adits, shafts, and exploratory diggings. The northern portion of the patented Carrara Marble Mine is located in the Project Area. In addition, there are numerous building foundations associated with an ill-fated Portland cement processing plant. Approximately 13.6 acres disturbance is associated with the historic mining activity.

4.5.2 Present Actions

The GGI Glamis Daisy Mine is located approximately four miles north of the Project. This operation consists of the West Zone and Secret Pass open pits, waste rock dumps, oxide ore heap leach pads, a carbon adsorption circuit for precious metal recovery, a bioleach heap leaching facility, and ancillary facilities. The GGI Glamis Daisy Mine is currently approved for 587 acres of disturbance. This includes 52 acres associated with the unreclaimed portions of the Mother Lode Mine.

The Bullfrog Mine is located approximately three miles southwest of Beatty. This open-pit and underground gold mine is operated by Barrick Gold Company. The mine is currently anticipated to cease operation in the year 2000 and is currently permitted to disturb approximately 1,347 acres (BLM 1988).

The Bonanza Satellite pit and Montgomery-Shoshone Satellite pit account for 76 and 170 acres, respectively. The Crowell Mine, also known as the Daisy Mine, is an underground flourspar mine located in Fluorspar Canyon and contains two shafts and 13 levels of workings. Maximum disturbance associated with this mine is approximately 10 acres. The Sterling Mine, located on the east side of the Bare Mountains includes 146 acres of active mine disturbance. The town of Beatty, Nevada, roads, and transmission right-of-ways account for an additional 309 acres of existing disturbance. Total existing or approved disturbance is approximately 2,350 acres.

4.5.3 Reasonably Foreseeable Future Actions

Reasonably foreseeable future activities include the continuation of mining, mineral exploration, expansion of the GGI Daisy Project and the Reward Project, and additional rights-of-way. The mining activity was estimated to continue until 2008 (BLM 1996). Disturbance would result from exploration at the Notice of Intent level. The Glamis Daisy Mine EA also included expansion of either the Bullfrog or Glamis Daisy Mines, increasing the acreage and configuration of heap leach pads, haul roads, pipelines, and ancillary facilities. In addition to the mining related disturbances, other administrative land uses, such as rights-of-ways, are also likely to occur.

Of the 562 acres of estimated reasonably foreseeable future disturbance analyzed in the Glamis Daisy Mine EA (BLM 1996), the Proposed Action would account for 214 acres. Approximately 391 acres of future disturbance is anticipated and would include the potential Gold Ace open pit and waste rock dump (Figure 2-1).

The total disturbance associated with past, present, and reasonably foreseeable future activities, exclusive of the Proposed Action, is approximately 2,698 acres.

4.5.4 Cumulative Impacts

The following resources were identified as having cumulative impacts from past, present, and reasonably foreseeable future actions during the analysis of the Daisy Project: Geology, Soils, Vegetation, Wildlife, Livestock Grazing, and Recreation. The Reward Project is not located within a grazing allotment, and therefore does not contribute to the cumulative impacts identified for Livestock Grazing.

Impacts to Geologic Resources have been identified as the continued removal of mineral resources as a result of the ore and waste extraction. Soils are impacted by the salvaging, stockpiling, and redistribution during the mine life. Approximately 2,536 acres of surface disturbance to soils would occur within the 201,000-acre cumulative effects area, or approximately 1.3 percent of the soil surface. All but approximately 730 acres, or 0.4 percent, of this surface disturbance would be reclaimed. Cumulative impacts to Vegetation would result from the removal of approximately 2,536 acres for the short term and permanent loss of approximately 730 acres due to unreclaimed open pits. The short-term loss of vegetation would also create impacts to wildlife species by removing cover and forage. The surface disturbance would not occur simultaneously, and concurrent reclamation would reduce some of these impacts. Vegetation would be established on all but 730 acres. The open pit high walls are potential raptor nesting sites, as well as nesting sites for some passerine birds (e.g., rock wren, white-throated swift, cliff swallow). The crevices in the fractured rock are also potential roosting sites for several bat species. Recreation within the cumulative effects area would be reduced during the period of active mining at each mine site due to public safety issues, but the areas would be open to recreationists following the cessation of mining.

5 CONSULTATION AND COORDINATION

5.1 List of Preparers

Bureau of Land Management, Las Vegas Field Office

Joel Mur	Project Leader, Minerals
Jeff Steinmetz	NEPA Coordinator
Jack Norman	Soils and Hydrology
Jeanie Cole	Wildlife and Special Status Species
Dave Wolf	Recreation, Visual Resources
Gary McFadden	Wild Horses and Burros
Bob Stager	Range Specialist
Gayle Marrs-Smith	Botany

Bureau of Land Management, Battle Mountain Field Office - Tonopah Field Station

Jack Hamby	Wild Horse and Burro Specialist

Glamis Gold, Inc.

Jerald N. Hepworth	Director Environmental, Health and Safety

Glamis Gold, Inc., d.b.a. Glamis Daisy Mining Company

Glenn Holley	Mine Manager
J. Michael Worley	EHS Coordinator
Doug McGibbon	Chief Geologist

Environmental Management Associates, Inc.

Gary N. Back	Project Manager
Richard F. DeLong	Project Principal
Opal F. Adams	Senior Geologist
Christy L. Morris	Environmental Specialist

5.2 Persons, Groups, and Agencies Consulted

Nevada Natural Heritage Program
James D. Morefield

Nevada State Historic Preservation Office
Rebecca Palmer

Nevada Department of Transportation
Thomas J. Fronapfel

Nevada Division of Wildlife
Teri Slatauski

5.3 Public Comments and Responses to Comments

This section of the Environmental Assessment (EA) includes copies of all public comments received in response to the Reward Project EA. The Bureau of Land Management's (BLM's) response to substantive comments are provided adjacent to the reproduced comment letters. The response to the initial EA (July 1999) consisted of eight comment letters (Comment Letters A - H). The EA was revised and reissued in December 1999. Five comment letters were received during the 30-day comment period. The comment letters and response to the comments are provided as Comment Letters I - M of this section.

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Appendix A

Standard Operating Procedures, Locatable Minerals

RMP APPENDIX M
Locatable Minerals

BLM provides for mineral entry, exploration, location, and operations pursuant to the mining laws in a manner that 1) will not unduly hinder the mineral activities, and 2) assures that these activities are conducted in a manner which will prevent undue or unnecessary degradation of the public land.

Notification to the Authorized Officer is required on all operations in project areas in which surface disturbance will be five acres or less.

A Plan of Operations and a Reclamation Plan are required in situations in which there will be more than five acres of cumulative unreclaimed surface disturbance in a project area. These two plans are also required for any mining activity on special category lands, such as Areas of Critical Environmental Concern and areas closed to off-highway vehicles. Appropriate off-site mitigation may be negotiated during a plan of operations review for locatable mineral actions when an irretrievable loss of important habitat is unavoidable, or a significant long-term adverse impact will occur. The preferred alternatives to off-site mitigation are avoidance of critical and crucial habitat and reclamation of disturbed habitat to approximate pre-disturbance productivity.

The Authorized Officer may require modifications of Plans of Operations to meet the requirements of the regulations and to prevent undue or unnecessary degradation of public land.

Plans of Operations cannot be approved until Section 106 of the National Historic Preservation Act, and Section 7 of the Endangered Species Act, and the National Environmental Policy Act have been complied with.

Reclamation of disturbed areas to meet BLM standards is required for all levels of activity: Casual Use, Notice, or Plan of Operations.

Additional regulatory requirements will be enforced in Wilderness Study Areas through regulations (43 CFR 3802) and through the Interim Management Policy for Wilderness Study Areas.

All operations shall comply with Federal and State laws, including those relating to air quality, water quality, solid wastes, fisheries, wildlife and plant habitat, and archaeological and paleontological resources.

The BLM will conduct validity examinations, reviewing the validity of mining claims to determine if a discovery has been made, under the following conditions:

1) Where a mineral patent application has been filed and a field examination is required to verify the validity of the claim(s).

2) Where there is a conflict with a disposal application, and it is deemed in the public interest to conduct a validity examination; or where the statute authorizing the disposal requires the removal of mining claims that are not valid. If the validity examination made in the latter case were to show that the mining claim was valid, the disposal action could not be completed.

3) Where the land is needed for a Federal program.

4) When a mining claim is occupied under the guise of the mining law and flagrant or questionable misuse of the land is observed, the BLM will undertake a review of the occupancy based on current regulations. If it is found, in fact, that such use is not necessary for, and reasonably incident to, mineral development, BLM will act to terminate the use and seek compensation for damages.

Withdrawals from mineral entry will be undertaken in cases in which there are significant resource values that cannot be adequately protected under the regulations concerning surface management. Such withdrawn acreage would include areas designated by Congress as wilderness, sensitive species or threatened species habitat, riparian areas, areas possessing important historical and cultural resources, and areas set aside for recreational development.

Bonding will be required for all plans of operations and financial guarantees will be required for operations conducted under a notice to ensure that satisfactory reclamation takes place. All operations using cyanide will follow the requirements in BLM's Nevada Cyanide Management Plan.

The BLM will coordinate each mine plan and mine closure in conjunction and consultation with the Bureau of Reclamation and Regulation of the Nevada Division of Environmental Protection. This coordination ensures that the State of Nevada reclamation laws are implemented on Federal and private lands, and that all necessary State permits will be issued and followed.

Appendix B

Conditions for Approval
Plan of Operations N53-98-015P